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The
GEOGRAPHICAL JOURNAL

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HENRY WALTER BATES: A CENTENARY

A. H. G. ALSTON

A LITTLE MORE THAN a hundred years ago, in the spring of 1848, Henry Walter Bates, afterward Assistant Secretary of the Society, set out from England for Pará and the forests of the Amazon where he was to spend the next eleven years.

Bates was born at Leicester on 8 February 1825, son of a stocking manufacturer. Leaving school at the age of fourteen, he was apprenticed to a Mr. Alderman Gregory. A thirteen-hour working-day starting at seven in the morning was followed by classes at the Mechanics Institute, where he studied Greek, Latin, French, drawing and composition. In his spare time he scoured the country round Leicester for plants and insects. He was interested in travel books and had already read Darwin's 'Voyage of the Beagle' which, as the journal of a scientific traveller, he considered second only to Humboldt's 'Personal narrative.' Among his Leicester friends was Alfred Russel Wallace, the English master at the Collegiate School. In the autumn of 1847 Wallace, his interest aroused by W. H. Edwards' 'A voyage up the River Amazons, including a residence at Pará,' proposed a joint expedition to Bates. They would explore the natural history of the Amazon and pay their expenses by the sale of specimens. Accordingly on 26 April 1848 they embarked at Liverpool on a barque of 192 tons burden and reached Pará on May 28.

The Amazonian forest was a naturalist's paradise, and Bates passed eleven years in exploring it from the delta to San Paulo—a distance of 1800 miles. Fourteen thousand insects were collected, which included eight thousand new species. At 4*d*. each, Bates calculated that he earned £125 17*s*. 8*d*. in a year and eight months, from which £98 18*s*. 8*d*. had to be deducted for expenses. Although the prime interest of the expedition was zoology, much geographical and ethnological information was also collected. Wallace returned to England in 1852 and published an account of his journey with the title 'Travels on the Amazon and Rio Negro.' Bates' best-known work on entomology is his paper on "Mimicry" published by the Linnean Society in 1862. He was deeply interested in the problems of variation and of the origin and geographical distribution of species. He considered that the fauna of the Amazonian region was derived from Guiana and not from southern Brazil. His original notebooks, which are preserved at the British Museum (Natural

History), show that he was an accomplished artist and are packed with detailed notes on the habits of the species observed and collected. The celebrated 'Naturalist on the River Amazons,' for which he is best known, was undertaken at the suggestion of Charles Darwin.

In April 1862 Bates applied for a post in the Department of Zoology in the British Museum, but was rejected in favour of a Mr. O'Shaughnessy who, though he lacked interest in entomology, fulfilled the conditions of examination and age limit. However, on the recommendation of his publisher, Mr. Murray, he was appointed Assistant Secretary of the Royal Geographical Society in 1864, and held the appointment till his death on 16 February 1892. As Secretary, Bates was untiring in securing geographical information from every quarter, in advising intending explorers and in helping the authors of papers for this *Journal*. Among other works, he saw Belt's 'Naturalist in Nicaragua' through the press and wrote an introduction to the "Supplementary appendix" of Whymper's 'Travels among the Great Andes'; and he edited the later editions of Mary Somerville's 'Physical geography.' Dr. Hugh Mill [1] has written of Bates' influence on the Society throughout one of the most formative and vigorous periods of its history:

"Henry Walter Bates . . . was then [at the date of his appointment] in his fortieth year, had never been robust, and was suffering from the effects of eleven years' arduous exploring and natural history collecting in the tropical forests of the Amazons. He was distinguished as an entomologist and had won the warm friendship of Mr. A. R. Wallace, with whom he travelled in Brazil. He was strongly recommended by Charles Darwin, who was struck by his power of mind and ranked him in some respects beside Humboldt. Indeed, he was almost too famous as the author of 'A Naturalist on the Amazons' to be likely to take kindly to a post which had just been reduced in dignity and authority, and which required above everything an orderly mind, patience in routine, and business aptitude. It was only the assurance of his publisher, Mr. John Murray, that Bates, naturalist as he was, was a good man of business too, which induced the Council to appoint him as Assistant Secretary for six months on probation. There never was a happier appointment. It lasted for twenty-seven years, during which the shy and reticent entomologist developed latent powers of insight, judgment, tact, and organization which impressed permanently upon the work of the Society the stamp of solid and unobtrusive efficiency. The conciseness and grace of his literary style also gave new precision and charm to the publications."

Bates' leisure was devoted to the study of his collections of insects and he was twice President of the Entomological Society. On 22 October 1921 a correspondent in the *Leicester Daily Mirror* acclaimed Bates as "Leicestershire's Greatest Man." 'The Naturalist' remains a very readable book, and a typical passage from it is reprinted below,[2] including a description of the scene depicted in the plate facing, which is also the frontispiece to Volume 1 of Bates' narrative.

[1] Hugh Robert Mill, 'The record of the Royal Geographical Society, 1830–1930,' p. 77, London, 1930.

[2] 'The naturalist on the river Amazons,' vol. 2, pp. 343–4, London, 1860.

Adventure with Curl-crested Toucans

After a drawing by J. W. Whymper, reproduced from 'The naturalist on the river Amazons' by courtesy of Mr. John Murray

Henry Walter Bates, F.R.S., Assistant Secretary R.G.S., painted on his return from the Amazons by Thomas Sims

"*The Curl-crested Toucan* (*Pteroglossus Beauharnaisii*).—Of the four smaller Toucans or Arassaris found near Ega, the Pteroglossus flavirostris is perhaps the most beautiful in colours, its breast being adorned with broad belts of rich crimson and black; but the most curious species, by far, is the Curl-crested, or Beauharnais Toucan. The feathers on the head of this singular bird are transformed into thin, horny plates, of a lustrous black colour, curled up at the ends, and resembling shavings of steel or ebony wood: the curly crest being arranged on the crown in the form of a wig. Mr. Wallace and I first met with this species, on ascending the Amazons, at the mouth of the Solimoens; from that point it continues as a rather common bird on the terra firma, at least on the south side of the river, as far as Fonte Boa, but I did not hear of its being found farther to the west. It appears in large flocks in the forest near Ega in May and June, when it has completed its moult. I did not find these bands congregated at fruit-trees, but always wandering through the forest, hopping from branch to branch amongst the lower trees, and partly concealed among the foliage. None of the Arassaris, to my knowledge, make a yelping noise like that uttered by the larger Toucans (Ramphastos); the notes of the curl-crested species are very singular, resembling the croaking of frogs. I had an amusing adventure one day with these birds. I had shot one from a rather high tree in a dark glen in the forest, and leaving my gun leaning against a tree-trunk in the pathway, went into the thicket where the bird had fallen to secure my booty. It was only wounded, and on my attempting to seize it, it set up a loud scream. In an instant, as if by magic, the shady nook seemed alive with these birds, although there were certainly none visible when I entered the thicket. They descended towards me, hopping from bough to bough, some of them swinging on the loops and cables of woody lianas, and all croaking and fluttering their wings like so many furies. Had I had a long stick in my hand I could have knocked several of them over. After killing the wounded one I rushed out to fetch my gun, but, the screaming of their companion having ceased, they remounted the trees, and before I could reload, every one of them had disappeared."

GEOGRAPHY AND WAR STRATEGY[1]

CYRIL FALLS

Chichele Professor of Military History, University of Oxford

WHEN I CAME to examine the subject set me by this Society I saw at once that it might be treated in two different ways. Both geography and strategy are imprecise words with elastic meanings. They may be concerned with the world at large, the land and water masses, the globe itself with all its resources. They may be concerned with narrower but no less important considerations: the characteristics of a coast, a country, a province, a mountain chain or a river valley. I could therefore have dealt with my subject on the broad lines of the illuminating address delivered by Professor E. G. R. Taylor to the British Association in 1947, or I could have confined myself to studying past and possible future campaigns in the light of their local geographical features and the approaches to their theatres by land and sea. I was bold enough to decide to do both, that is, to look first upon the world as a whole and then upon theatres of war. That seemed the most interesting method. But when I set to work I found that within the compass of a lecture it was not possible for me to be thorough along those lines. The result is that I cannot promise more than a few suggestions and reflections, something to think about, disconnected ideas upon the subject. I hope it will be worth while and that you will not grumble if you find yourself rather abruptly switched from one aspect to another.

To-day more than ever the strategist, like the economist, has to look upon the world as a whole. I do not mean by this that distance has been abolished; that is a cant phrase which may lead to absurdities. It would be absurd, for instance, to say that modern weapons and means of communication have made New Zealand as vulnerable as the British Isles. Common sense tells us that it is not. But the modern conqueror who succeeds in dominating the main land masses of the world will have everything else speedily added unto him. New Zealand will not long elude his clutches. Strategically as well as geographically the earth is a whole. And the earth is something about which we know surprisingly little. Even its precise shape is not quite clear, and it seems to be subject to changes in shape of which we know nothing. We make maps, that is projections on paper which are of course conventional, and the projection which the public knows best is the most uninformative and even deceptive—I mean of course Mercator's. We compile lists of the times and levels of tides; but they go out of date without our noticing it. Only a very small proportion of the earth have we covered by instrumental survey, and wonderful as modern methods of photographic survey are, they have not yet replaced instrumental survey on the ground.

The more we study the world, the more we feel the gaps in our knowledge of it. Professor Taylor, about whose address I spoke just now, suggests that

[1] This paper was read at the Evening Meeting of the Society on 10 May 1948.

the exact size and shape of the earth may be elevated to the rank of "top secret" and that for a country to be ill-mapped might provide a species of camouflage. Both may well be the case. When working on Russian maps during the war I was told that railways might be plotted several miles off their true course, and if the most recent Russian surveys are allowed to pass west of the Iron Curtain I shall be most astonished. Bad mapping is indeed camouflage to-day—and not only to-day. When Sir Arthur Chichester was carrying out the Plantation of Ulster in the reign of James I he had a survey made by Sir Josias Bodley and William Parsons; and though the country was then quiet these prudent men took a guard with them. Sir John Davies, the Attorney-General, wrote home: "Our geographers do not forget what entertainment the Irish of Tyrconnell gave to a map-maker about the end of the late rebellion; for, one Barkeley being appointed by the late Earl of Devonshire to draw a true and perfect map of the north part of Ulster (the old map of Tyrconnell being false and defective), when he came into Tyrconnell the inhabitants took off his head, because they would not have their country discovered." From their point of view they acted wisely.

And if it be objected that the modern system of stereoscopic survey from the air, though not the equal of ground triangulation with astronomical observation, will still render it possible for every part of the globe to be relatively well mapped, infinitely better than it has ever been before, I agree; but this is nevertheless the sort of intelligence which it may be difficult to obtain, especially in time of peace. And even in war it would be hard for photographic aircraft to penetrate deeply into a territory of vast extent so as to cover more than a fraction on the outskirts. Here the little country may be handicapped in comparison with the big one, because a little country may be much more easily photographed against its will. And here also the democratic nation may be handicapped as against the totalitarian, because a democratic nation does not conceal its geographical surveys. Yet even in democratic countries in these troubled days I can well conceive certain features being omitted from the maps of the future.

World geography should be a subject of study for the commander and staff officer. They can get from it not only concrete information but also general ideas which may be of high value to them in their profession. Another subject which will not only give them concrete information but will be fruitful in general ideas is historical geography as taught by the modernists such as the late Sir Halford Mackinder. His brilliant expositions of the growth of states and cities under the influence of geographical features made a deeper impression abroad than at home. He became in a sense the father of the German school of geopolitics. As developed by the Nazis, geopolitics is a bogus science. It was used as a justification for absurd racial theories, for naked aggression, for the notorious doctrine of *Lebensraum*. Yet it has within it a core of scientific truth. The features of a country, its mineral and agricultural wealth, its situation with regard to world communications and their junctions, do in fact go far towards determining that country's destiny.

The qualification of a great power to-day depends largely upon its minerals, above all coal, iron ore and oil, though many others may be added, some of which have a special application to its actual armaments for war. But it must

also possess the basis for a great and vigorous population, and this implies big stretches of lowland, reasonably well watered, with soils suited to certain grain crops and to cattle. Political and social conditions, situation with regard to the most advanced forms of civilization, may retard its rise to power as they did to a striking extent in the case of Russia and even more so in the case of Japan. But if it has the qualifications it will sooner or later enter into the ranks of the great nations; and then its rise may be very rapid. As world time is measured, it was rapid in the case of Russia and astounding in the case of Japan. A nation need not be altogether self-sufficing, but if not it must possess natural communications with outside sources of wealth or secure them for itself by sea power. One can think of various other attributes of power. Falling water is one of the chief of them, and this is an age of great power dams. A moderate and equable climate is another, but not a necessity. Russia has an extreme climate which condemns its agricultural population to

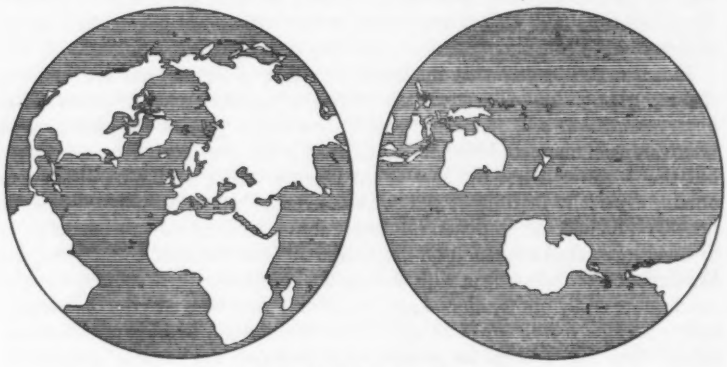

Fig. 1. Land and water hemispheres

long spells of inactivity, yet this has not prevented the development of great agricultural wealth. But to a certain extent climate and race are linked. It seems to be the mixed climates which produce the highest human energy, even when they go to extremes.

Not long ago the American airman General Spaatz pointed out that the qualifications of great powers to-day were to be found only in the northern hemisphere. They were to be found above all in his own North American continent, in Northern and Central Europe and perhaps in a block of territory comprising Japan, Korea, Manchuria and adjacent parts of China and Far Eastern Russia, all in the northern hemisphere. The northern hemisphere is a land hemisphere, the southern a water hemisphere (Fig. 1). Apart from these European and Asiatic blocks, nowhere else in the world were there regions which could constitute a peril to the United States within measurable time. This factor, he said, must greatly modify United States military policy in an age of long-range weapons. And he pointed out an entirely new feature in the strategic situation of North America, the fact that the northern fringes of Europe and Asia, from North Cape in Norway to East Cape on the Bering

Strait, formed a rough semi-circle of the Old World facing another semi-circle of the New World formed by the north coast of Greenland, the arctic islands north of Canada, and Alaska; while Alaska itself, looking westward, almost touched Far Eastern Russia (Fig. 2). He thought it possible that some long-range weapons might be projected across the polar region into the North American continent. And I need not add that this consideration—which is new because these intensely cold areas had no strategic significance whatever in the past—accounts for the fact that Canada and the United States now look north as well as in other directions, and accounts for the defence measures

Fig. 2. Northern fringes of the Old and New Worlds

taken in concert by the two states to cover approaches from this hitherto disregarded direction.

What General Spaatz said about the impossibility of a great world power appearing within measurable time anywhere outside the northern hemisphere was perfectly true; but there are land masses in the southern hemisphere, small by comparison with those of the northern but in many respects richly dowered and capable of exerting great strategic influence and perhaps of swinging over the balance of power one way or the other, according to the direction in which they lean. One is Australia with New Zealand and the

East India Islands, the last lying mainly south of the equator. Here we have the only white population in the Pacific, and immense wealth of raw materials. Australia and neighbouring territories have not the full qualifications of a world power for as far ahead as we can see, but they are potentially a power of the second order and, as I have said, may exert great strategic influence.

The second is of course South America, prosperous, still expanding, one of the world's great food depôts as well as rich in other respects. South America is mainly in the southern hemisphere, the equator running north of the Amazon. And this continent lies much closer than does the United States itself to the Panama Canal which is of such vital importance to United States strategy. There we see in the recent Treaty of Rio, fathered by the United States but not imposed, not signed under duress, that it is possible in these days of what are called power politics for the greatest power in the world to gain legitimate ends without threats or bullying. One must admire the combined prudence and moderation of the dealings of the United States with South America. At the same time one must realize, from the great pains bestowed by the President and the Secretary of State upon the question of American unity against aggression, how highly they rate its importance.

And then there is Africa; for though only about a quarter, anyhow less than one-third, of African territory lies in the southern hemisphere, this fraction contains a larger proportion of its actual and potential wealth. South of the equator there are to be found huge resources virtually untapped until this generation and capable of being almost indefinitely expanded. And they are, so to speak, tucked away behind the immense barrier of the Sahara. Africa might become a storehouse from which the present shortages of Europe could be largely supplied. But it would take time, money and organization. At present it is only in the Union of South Africa and perhaps in Southern Rhodesia that there exist administrations able to tackle the possibilities which face them.

In Africa too there is an alliance between economic and strategic possibilities. Its northern shore fringes the Mediterranean, its eastern the Red Sea and the Arabian Sea, great traffic routes of the world. And to put matters in a concrete form, for I see no reason to be afraid of doing so, the continent flanks a possible Russian drive across Western Europe and may thus be considered as a base for a counter-offensive. It is not possible to imagine Africa as a great power in itself, at all events not in this century nor perhaps in the next; but in a very much shorter space of time it might become a great adjunct of power.

I warned you that I should be able only to look at geography in relation to global strategy for a brief moment. Now I am going to increase the map scale so as to picture a smaller area. I cannot better picture in terms of geography what has been throughout history one of the vital problems of European strategy than by quoting a passage from the writings of General de Gaulle:[1]

"Supposing one has forced a passage of the Rhine and entered Germanic territory. The soil, in all its accidents, fights against the invader. If he should take the southern route, a score of *massifs*, that of Baden, the Hessian,

[1] Freely translated from C. de Gaulle, 'L'armée de l'avenir,' Paris, 1934.

Westphalian, Swabian, Franconian, Thuringian, Saxon, facing in all directions, combine to disperse him. But if he would march by the north, how many rivers cut across his route, how many bogs, heaths of sand, areas of ponds, spreading out indefinitely, use up his forces and his courage! It is the old story of Varus, of Soubise, of Moreau; it recalls the supreme hesitation of Foch.

"In his five hours' flight in an aircraft from Berlin to Paris the traveller sees marked on the ground German security and French weakness. On leaving the banks of the Spree he can in the long leisure at his disposal until he

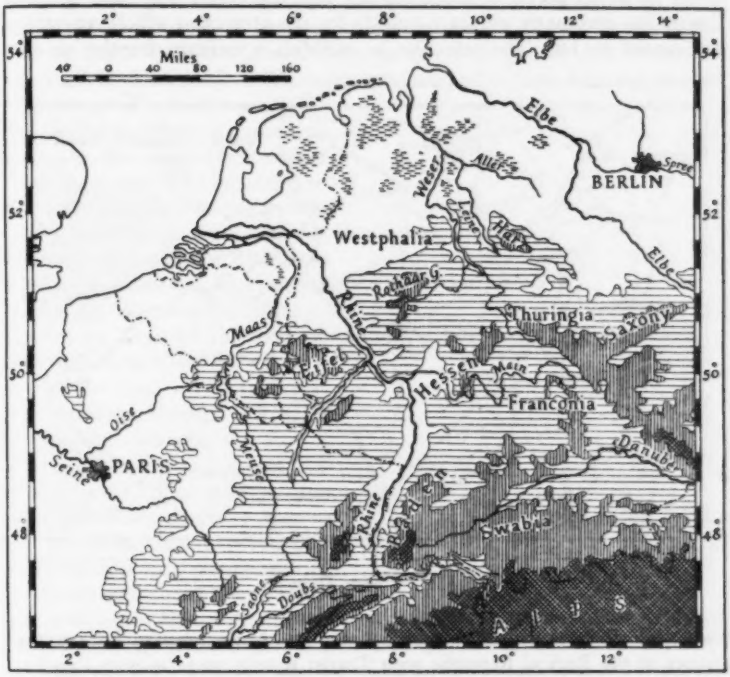

Fig. 3. Orography of the Franco-German frontier marches

reaches our Meuse, over one hundred and twenty-five leagues, discern the moats, the Elbe, the Aller, the Leine, the Weser, the Rhine, contemplate the fortresses, the Harz, the Hessian Mountains, the Rothaargebirge, the Eifel, whose nature pays homage to the Germans. Then suddenly the ground is smoothed out, becomes softer, is humanized. No more mountains, no more ravines, no more escarpments. It is France! Hardly are we clear of the frontier when this land in form of a basin which dips towards its centre, these rivers, these railways, these routes converging in the same direction, this suburban air which the country rapidly assumes make us feel that Paris is quite near. And there it is already, a monument, a mart, a workshop,

collecting a thousand arteries, ill guarded by its mediocre hills, fringed by easily permeable woods, lacking an acropolis, a prey so close, so fine and so easy."

Surely in those words we find the key to half the history of Western Europe. They explain much more than that France has stood for century upon century in deadly danger from the east. They explain, for example, why France, which might have been the greatest seafaring and naval and colonizing race of the world, has never reached that position. She could not afford to. And they explain diplomatic history and military history over a long period. As Napoleon said, the policy of a state is in its geography. The two forms in which policy is expressed are diplomacy and war. And in both France has constantly sought a remedy for the protection which geography has denied to her. The attempts to establish a military frontier on the

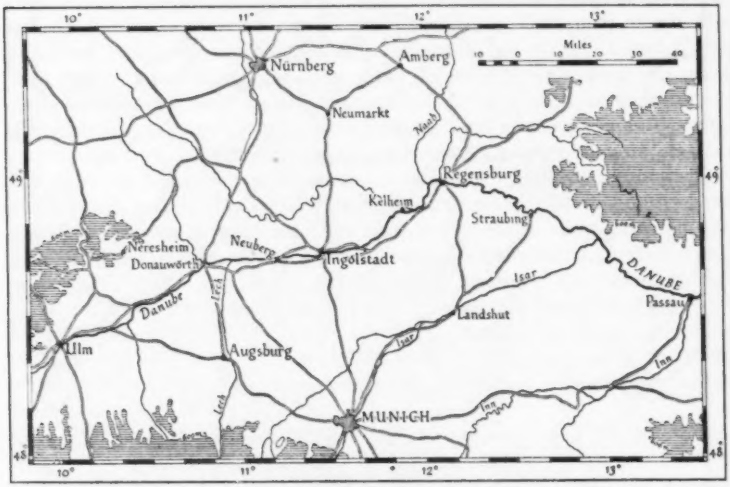

Fig. 4. Upper Danube

Rhine, the alliances with Protestant Sweden and Muhammadan Turkey, the alliance of the Radical Republic with Tsarist Russia, pacts as with Czechoslovakia, patronage of the Little Entente, concessions to Mussolini, flirtations with Soviet Russia, carefully cultivated friendship with Switzerland which bars the entries into Burgundy and the valley of the Rhône—all these can be traced to the geographical facts which General de Gaulle describes as unrolling before the eyes of the traveller flying from Berlin to Paris.

Now I take a smaller area again, and on a larger scale. In military books you sometimes find a quotation from the Archduke Charles that the Danube is the strategic key to southern Germany and that the result of wars there is always decided upon the Danube. I suspect that a large proportion of those who read these words are vague in their minds about what the writer means. I own I was until I had studied his works and his actual campaigns more closely. His meaning is that there is a long stretch of the Danube, from Ulm to

Regensburg, where there were in his day—and the general conditions have not enormously changed—a dozen good crossing-places with bridges. Farther downstream, from the Isar to the Inn, there was only a single crossing, that at Passau, and no road along the left bank. But from Ulm to Regensburg there were these twelve crossing-places and excellent communications (Fig. 4).

And he certainly exemplified his meaning by his brilliant conduct of the campaign of 1796. The French, in superior numbers, had driven him back from the Rhine. They then advanced with two separate armies, Moreau on the north bank of the Danube, faced by the Archduke himself, Jourdan on the highway through Nürnberg, pushing in front of him the Austrian force which the Archduke had detached to contain him. At Neresheim the Archduke struck a blow at Moreau. Then he fell back quickly and crossed to the south bank of the Danube, drawing Moreau after him. Leaving another detachment to hold Moreau there, the Archduke then recrossed in secret to the north bank with a small force and hurried north to assist the detachment which was facing Jourdan on the Naab. He came in on Jourdan's flank, beat him in two battles, and swiftly drove him back over the Rhine in confusion. Then he marched up the right bank of the Rhine, came in on the flank of Moreau who was retreating through the Black Forest after learning the fate of his colleague, and drove him also back over the Rhine. And the basis of this brilliant campaign was, as the Archduke himself points out, this stretch of the Danube with its excellent communications. Without it he would have been unable to execute his manoeuvre. The formation of double bridgeheads in this reach of the Danube was of inestimable benefit to those who knew how to make use of them. Ten years later the Austrians were commanded by a man who did not, and everyone remembers what happened to General Mack in the double bridgehead of Ulm.

Fig. 5. Burma and the Indian approaches

The next geographical study of a theatre of war I want to make—though perhaps I am going so fast that I should say I am glancing at it rather than studying it—is that of the Burmese theatre of war (Fig. 5). I need not remind you that the campaigns in Burma were fought in the most disadvantageous way from our point of view. The first look we take at an orographical map shows us that the natural way in which to fight a campaign in Burma from a base or bases in India is through Rangoon, and therefore that the natural way in which to open it would have been to retake Rangoon first of all. It is all very well to say that the Indian Government in the years before the war ought to have improved the land communications with Burma. Perhaps they ought

to have. We all of us leave undone things we ought to have done. But I feel sure that if you or I had been responsible in those years and had had to pick the objects on which to spend a limited amount of money we should have put a road or roads from India into Burma on a relatively low priority. After all we were a naval nation, not what Mr. Churchill calls a "land animal." If we lost command of the sea all calculations would be upset. To envisage inability to maintain the sea routes between Calcutta or Colombo and Rangoon we had to presuppose not only a simultaneous war with Germany and Japan but also the complete overthrow of France; for it was that which brought the Japanese into French Indo-China and Siam. We had to presuppose a disaster such as the sinking of the *Prince of Wales* and *Repulse* without their having inflicted damage on the Japanese fleet. We had to go even further and presuppose such prior calls from the European theatre of war that we should not be able to allot coastwise craft to Burma even when there was a possibility of using them. As early as the winter of 1942–43 there was a possibility of using such craft to secure Akyab; but at the last moment Field Marshal Wavell was informed that they were not available, being required for the landings in the Mediterranean theatre. So the capture of Akyab was attempted by an advance down the Arakan, which failed after heavy fighting.

Not until the very end was the naval material forthcoming in sufficient strength for the capture of Rangoon by sea, though a little was produced earlier on the Arakan coast. And when it was produced to take Rangoon it arrived too late for practical purposes. We did land at Rangoon, but to find it empty. General Slim had by this time already won the campaign on overland communications and air supply and transportation, and I do not think the Rangoon landing can be said to have made any great difference in the long run.

And so the campaign of General Slim and of the American-directed Chinese forces which started from the Hukawng valley had to be conducted in the most difficult of all ways. There were no roads leading from Assam across the huge jungle-clad ridges which barred the way to the valleys of the Chindwin and the Irrawaddy. Everything had to be improvised. But none of the extraordinary work accomplished, such as that of the American railway battalions on the Bengal–Assam railway, would have sufficed to provide a basis for a successful campaign entirely over land communications. It could not have been done. To atone for the weaknesses of the land communications, inventive minds set themselves to work out revolutionary methods of air transport. These were produced under the pressure of sheer necessity. I yield to none in my admiration for the planning and organization or for the boldness and determination of the pilots who flew under abominable conditions in the monsoon, but I am certain that the stimulant was a necessity and that their minds would not have worked on those lines if there had been any hope of developing the administration on more traditional lines. A division which was enveloped by the enemy or which was advancing through country in which it could not maintain a line of communication was supplied by air not as a matter of emergency but as a matter of course. A whole division could be picked up and transported from one sector to another over the heads of intervening Japanese forces. Reinforcements in thousands

could be flown in to a hard-pressed garrison, and administrative troops who had temporarily become an embarrassment to the defence could be flown out.

The tactics of the campaign were influenced as well as the strategy. Thus a division marching along a valley would not necessarily have to seal it off behind as in normal circumstances. The divisional commander did not have to waste troops by stringing them out along his line of march. So long as he had a strong rearguard, it did not much matter to him if the Japanese flowed into the valley in his wake. And this new conception of administration, which may have so important an effect upon warfare of the future, was created by the terrain itself, by those gigantic offshoots of the Himalayas which are called the Lushai hills, the Naga hills, the Patkai hills, and farther south the Arakan Yoma and Pegu Yoma which overhang the basin of the Irrawaddy; and created also by the difficulties of operating in the natural way over sea communications.

Now I look back again to Europe for a moment and to ground which has been familiar to British or English forces for centuries. The Rhine can be outflanked in Holland, but the nation which has always up to the present century, and to some extent in the present century, desired to force a passage of the Rhine from west to east has been France, and France could only turn the Rhine barrier if she possessed control over Holland, which was not often. Prior to this century, when we went into Holland it was not generally for the purpose of forcing the Rhine barrier but in order to keep the French out of the Low Countries.

Fig. 6. Mouths of the Rhine, Maas and Scheldt systems

On the two occasions in this century when we fought as allies of the French, we were unable to gain possession of north Holland and so could not outflank the Rhine barrier. The country is in any case not very suitable for operations because it is so easily inundated by a defender. In the First World War Holland's neutrality was respected, so that the question never arose. In the Second World War, Holland's neutrality having been early violated by Germany, it did arise. As the 21st Army Group's spearhead was thrust northward into Holland there seemed every chance that the task of outflanking the Rhine barrier might this time be accomplished. If it had been it would have had a very important effect upon the future of the campaign, because there are no obstacles of any importance, except those of the soil itself, in passing round the elbow of the Rhine until the Ems is reached; the Ijssel cannot be called a serious barrier.

But there were three factors which fought against us. First of all, the number of water obstacles (Fig. 6). The Rhine divides into two channels, the southern called the Waal, the northern the Lek or, higher up opposite

Arnhem, the Neder Rhin. Farther south the Maas or Meuse for a short distance follows a parallel course, forming another great water obstacle. And as if nature had not done enough to make things difficult, man has thrown in two parallel canals, the first known as the Meuse-Escaut or Maas-Scheldt, the second the Albert Canal. The second factor was the nature of the soil, particularly north of the Maas where it is spongy even for Holland. The third was the bad weather, especially disadvantageous when allied with this sponginess of the soil, which practically confined the advancing column to the main road. I do not say that the bad weather should have come as a complete surprise to us, because rain in September is common enough in Holland. And so, despite the skill in mounting a triple airborne operation and the gallantry with which it was carried out, especially at Arnhem, the 21st Army Group leapt four barriers, the two canals, the Maas and the Waal, but failed to maintain its footing beyond the last. I think I am right in supposing that this failure modified not only the Group's strategy but the whole of the Allied strategy in the west until the passage of the Rhine had been effected. Everybody knows something of the story of Arnhem, but I fancy there must be a great number of people who fail to grasp the significance of the episode because they do not connect first of all the motive involved, the turning of the line of the Rhine, and secondly its fate, with the nature of the country, in fact with the local geography.

I could enlarge on this subject almost indefinitely. I might have dealt with the drainage system in the Ypres sector, which in 1917 we, the attackers, dislocated and smashed up by our own artillery fire, thereby handicapping ourselves and providing defences for the enemy. I might have spoken of the situation in the main theatre of the American Civil War, where the proximity of the Federal and Confederate capitals, Washington and Richmond, so markedly influenced the whole course of operations. I might have talked about Norway in strategy; the malign influence of German possession of its coast and its numerous fjords in the Second World War and its extraordinary significance to-day, the vital issue being whether it can be preserved from Russian domination which would be at least as disastrous from our point of view as was German domination. I might have considered the situation of Italy, so wonderfully shielded from aggression by land by reason of the Alps and the cover afforded by Switzerland but with a portal open at Trieste to a potentially hostile state. As it is I have time only to glance at these things in passing.

I will end with a story told me by General Laycock in 1944, soon after the allied landing in lower Normandy, because I think it illustrates a point I want finally to leave in your minds. At an early stage in the planning he put three small teams, which were not to communicate with each other until they had their results ready, on to the problem of deciding where the landing ought to be made. They all produced the same answer—the bay of the Seine. That appeared to him not only striking but actually perturbing. By this time he knew that the Planning Staff had actually plumped for the bay of the Seine though his teams did not know it, and he thought that if there was such extraordinary unanimity on the subject on our side the German intelligence would certainly have come to the same conclusion. In fact, it does not seem to have done so.

The point I want to make is that to the mind which has been specially trained to work along such lines geography will constantly hold out a key to strategic problems. But it requires intense application and a most diligent accumulation of facts before the problem can be answered with as much certainty and unanimity as it was here. We had got down to it quite steadily; the landing took place in 1944, and I think it was in 1940, after the fall of France, that the Admiralty said it would like to look at my seaside photographs which, curiously enough, included some of the beaches of Hermanville and Lion-sur-Mer. Obviously you will never get either all that application or all that information in time of peace. But we can in time of peace train the minds and the eyes of men so that if ever they are called to walk these paths the way will be familiar to them. I do not know that we do this now in our military educational establishments. We teach topography of course, but that is a narrower subject and, odd though this may sound, the standard of map-reading in a generation of fighting men which has passed through a great war is one of its greatest weaknesses. The unimpeachable authority who told me this the other day said that he thought, where the Army was concerned, this might be due to the wealth of air photographs with which the Army was supplied and the abundance of road signs. Possibly much of our geographical teaching in all fields wants shaking up. The opportunity was never so great and the subject was never so interesting. I am only an amateur in that field, but it seems to me that for those who are experts modern geography may sketch not only the world's past and present but also perhaps its future.

DISCUSSION

Before the paper the PRESIDENT (The Rt. Hon. LORD RENNELL OF RODD) said: This evening we are to have a paper by Professor Cyril Falls, better known to most of you as the Military Correspondent of *The Times*. I think however he would claim that his professorship, the Chichele Professorship of Military History in the University of Oxford, was a greater claim to fame. We are particularly fortunate in being able to welcome to-night, among our other guests, the Chief of the Imperial General Staff, Field Marshal Lord Montgomery, and the Vice Chief of Staff, Lieutenant General Gerald Templer. I will ask Professor Falls without further delay to read his paper on "Geography and war strategy."

Professor Cyril Falls then read the paper printed above.

The PRESIDENT: You have heard Professor Falls range over a subject as great as the earth and as wide as the mind of man. He has spoken of things that are very near some of those here to-night and among them Field Marshal Montgomery, whom I am going to ask if he will comment on what Professor Falls has said.

Field Marshal LORD MONTGOMERY (Chief of the Imperial General Staff): I must, Mr. President, refuse your invitation to comment on what Professor Falls has said. I should like to say I hardly recognize him by the name of "Professor Falls"; I know him as Cyril Falls. Any comment from me on what he has said would not be right. I have listened to a really supreme exposition of this business of geography and war strategy, and I would say that amongst those who know about it Cyril Falls stands proudly in the front rank. We

soldiers deal with a great many military writers and gentlemen of the press at various times; we have complete trust in Cyril Falls.

There are in the world, sir, historians and soldiers, and if it were not for the soldiers the historians would have nothing to write about! They seize on our victories, such as they are, they examine them and explain how much better it would have been if they had been gained in another way; and they cash in on our failures and on the whole they have a very good time. I suppose we provide Cyril Falls with a certain amount of his income, but I do not grudge him one penny of it; he deserves it all and more.

You have asked me, Mr. President, to comment on the lecture and I have refused to do that. I would however like to take up the story and try to link geography to my own profession. I am one of those who believe that what matters in war is the battle, and that the war is won by victories in battle. That needs to be remembered by statesmen in wartime when they are weighing up the military and political considerations and deciding which should carry the most weight. I often used to feel during the war that it was not always realized that political considerations which are going to end in failure are no good; they do not advance the cause of a war. Victories in battle win wars. That being the case, I feel the making of war resolves itself into very simple issues, and the simplest in my view is: what is possible, and what is not possible? In trying to discover what is possible and what is not possible, I would say that three things matter most. I am assuming, of course, that the weapon is a sharp weapon and not a blunt one; that is to say, that you have good armies and so on. I am assuming that you have a good command set up to wield the weapon; and finally that the Allied solidarity is complete. Assuming all that, what is possible will depend firstly on geography, secondly on transportation in its widest sense, and thirdly on administration. Really very simple issues, but geography I think comes first.

If you agree with that, I would like to take two cases: one is Singapore and the other is north-west Germany. I must be careful in speaking about Singapore because the despatches have recently been issued, and I must not say what I should not although I have no doubt that a great many people would like me to! I read recently in an article written by an historian that it might well be that Singapore was lost in Whitehall some years before the war. I do not comment upon that; that would be saying something I should not. But I would offer that thought for historians in the future. Was it or was it not true? Whether it was true or not, I would say as a soldier that the historians will always find the map of great interest as to whether a better show could have been put up at the time by the weapon. The interesting point for the historian will be the geography of Singapore and the Malay peninsula to the north and the effectiveness, that is to say the sharpness or the bluntness of the weapon. I believe that we soldiers will probably not come very well out of that because the weapon was not as sharp as it should have been in that the soldiers were not trained as well as they might have been for that sort of warfare. It took some months or years of war in the Far East before it was understood that the soldier has to take a clear stride in overcoming the medical and physical conditions of the country. Whereas in the days before the war no soldier in that area was allowed to go out in the sun without a topee on his head and a spine-pad, it did not take long during the war to bring about a realization that neither was necessary. One went out into the desert in the sun in a beret during the war. In fact, the war in Singapore and other such parts did one good thing: it got rid of the topee and the spine-pad!

Let us turn to another area. Singapore I do not know, but this area I know

very well, and I take it because Cyril Falls put on the screen two maps which recalled to me many memories: the campaign after the Normandy battle, the Seine, right up to the Rhine, and so on. I would offer historians this thought: that their great argument for years to come will centre round the development of the Allied strategy after crossing the Seine, that is, after the Normandy battles had been won.

As you know, there were two schools of thought. There was one which wanted to exploit the situation at once and deal a blow which would make quick recovery for the Germans impossible. That school of thought wanted to see a bridgehead over the Rhine, the great Rhine barrier which Cyril Falls mentioned, and wanted to get firmly established on the other side of the Rhine before the bad weather of the winter set in. That bridgehead over the Rhine must give access to the North German plain because it was in that plain that, from the geographical point of view, the promise of decisive results existed. And the object of that school of thought was to shorten the war. It also held that there were possibilities of bringing the war to an end in Europe with a political balance very much more favourable to an early and stable peace than that which we now have. You know the other school of thought; it planned an advance on a broad front, and that school of thought was adopted. Once that broad-front plan was adopted there was no question of finishing the war in 1944; it was obvious that the war must go on into 1945.

After the Falaise battle I do not think I personally had any doubt whatever about our ability to cross the Seine. I cannot remember; I must ask the chief of my Intelligence whom I see here, but I do not think I had any doubt at all. My eyes, and I think the eyes of us all, were fixed on this great geographical barrier of the Rhine. Could we get over the Rhine and get access to that great plain of North Germany? As Cyril Falls explained, we finally went to outflank it in the north.

Another factor—I do not think this has ever been said before—another factor which took us to Nijmegen and Arnhem, instead of farther south down the Rhine, was the V2 attack going on in England. We had settled the V1 by cutting across the back of the Pas de Calais. I well remember receiving a telegram from London: could we bring relief to England from the V2 menace? That, plus the need to outflank the vital barrier by the northern route, took us up to Nijmegen, Arnhem and so on. You know what happened. We got over every obstacle, every single one, including the Neder Rhin; but the weather went bad on us and we were too weak on the ground, because of this broad front, to offset the bad weather and supply our troops by road. The point really is that even if we had got over the last barrier, we could not have brought the thing to fruition and finished the war because we were not strong enough; and so the war had to go on into the next year.

I would like to say that I agree with practically everything Cyril Falls has said. I do everything he tells me to do; I consider the world as a whole, definitely I obey orders in this respect. In my business as a soldier—I used to be a soldier and I suppose I am still—as I sit in my office I have in front of me a great Map of the World, and all day long I consider that world map as he told us we should do. My own experience is, and I am sure it will be the same for many soldiers in this room, and Lord Chetwode will agree with this, that every single operation that confronts one in battle is in itself unique and it is impossible to consider it in any other way. I was recently reading Winston Churchill's 'Marlborough, his life and times' and I came across this passage: "There is no surer way to disaster than to copy the plans of bygone heroes and to fit them to novel situations." I agree very much with that.

But there is one statement of Cyril Falls with which I do not agree: that the officers of the Army were always dependent on road signs and cannot read maps. I personally travelled over 2000 miles of desert in Africa and I never saw a single road sign. I believe that the officers of the Eighth Army learned a very great deal of geography in the desert. I certainly did. And I learned during the recent war that every situation has to be tackled as a wholly new problem to which there is a wholly new answer. I believe in that very firmly indeed, particularly in the geographical approach and the link between geography and the making of war. Cyril Falls has put that to us to-night extremely clearly.

The PRESIDENT: Comment on Professor Falls' paper is not in order. And comment on the Field Marshal's remarks would obviously be still less in order! There is therefore no other course open to me except to thank Cyril Falls for his very illuminating paper, illuminating if only for the reason that he has brought out so clearly not only the value but the absolute necessity to our very existence of geographical knowledge. I also thank the Field Marshal for having been good enough to say what he has said; and we are all grateful to him for having reminded us of those essential things without which no battle can be fought either in war or in peace: the sharp weapon, the desire to win, the necessity to exist. These are the very things of which Field Marshal Montgomery is the great exemplar in our age.

THE GEOMORPHOLOGY OF NORWAY[1]

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MOST PEOPLE TRAVELLING in Norway visit the western parts and the high mountains. There even the casual observer is struck by the assemblage of geomorphological features: the strandflat with its innumerable islets, the fjords cutting into the upland with its undulating upper surface, and the high mountains diversified by local glaciation. While this full development is confined to the central fjord and mountain region, the clues it offers are valid over most of the country other than the south-eastern lowlands, parts of the Trøndelag area, and the country east of Lyngen fjord. In a general way the statement may be made that the present morphology of Norway is conditioned by the interplay of at least two erosion surfaces elevated during the Tertiary, with the forms resulting from Pleistocene erosion and deposition, both mainly glacial. Nevertheless the importance of structure is also everywhere apparent (Plate 1).

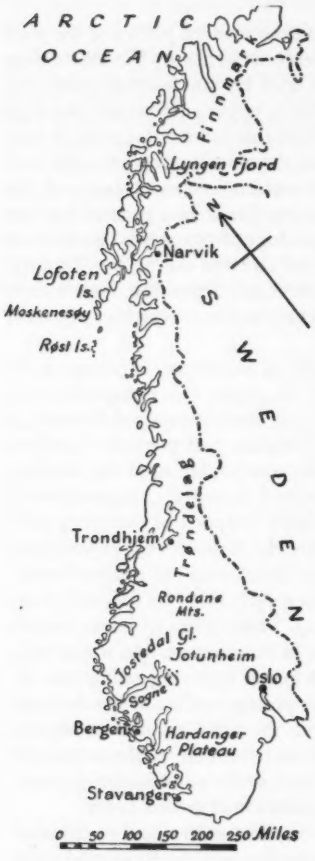
The most important purely structural feature in Norwegian landscape is the so-called sub-Cambrian peneplain (Plate 2). In places this peneplain, even though recognizable in surface morphology, has been strongly deformed by the Caledonian folding or broken up by Permian, and possibly Tertiary, faulting; but in the south-east as well as on the central plateau of the Hardangervidda and in eastern Finnmark a resurrected peneplain, approximately horizontal, is clearly discernible. It was probably stripped of overlying sedimentary rocks and Permian lavas, mainly before the Pleistocene, but was given its present character by differential ice erosion developing old zones of weakness as an angular pattern of depressions, now mostly filled by fini- and postglacial sediments or by lakes and bogs (Plate 2). This applies with less force to the Hardangervidda plateau which appears to be more intact, and whose sub-Cambrian date is everywhere attested by patches of overlying sediments. In south-eastern Norway, on the other hand, the present surface of the Archean rocks can be definitely proved to coincide with the sub-Cambrian peneplain only in a very few places. It is really rather from habit that we there speak of the generally well-levelled surface of the Archean as the sub-Cambrian peneplain, although the former may in places be hundreds of metres lower.

Within the Oslo region, a faulted depression filled with Cambro-Silurian sediments and Permian eruptives, the present surface was chiefly shaped prior to the Pleistocene by differential general erosion working upon a very varied assemblage of folded and faulted shales, limestones and sandstones, penetrated and capped by plutonic and effusive rocks. So essentially structural in consequence is the landscape of the Oslo region that there are no major features belonging to glacial erosion except lake and fjord troughs.

Looking at Norway as a whole, the main morphological features are

[1] This paper was read at the Afternoon Meeting of the Society on 22 March 1948.

certainly the elevated Tertiary surfaces, cut into by late Tertiary and Pleistocene erosion. A west–east section across the country shows the zone of maximum elevation to lie somewhat inside the present coastline, but even at the coast the elevation has been several hundred metres (Plate 3) and according to Olaf Holtedahl has resulted in a number of submarine faults, separating the mainland from the shelf outside. From this zone of maximum elevation there is a gentle slope towards the east. The stages in denudation chronology towards the west and south in southern Norway are still very uncertain; perhaps a number of steps may be recognized (Plate 3). The identification of surfaces in northern Norway has as yet no solid foundation. It must be remembered that a set of surfaces found in a particular place may be structurally conditioned, and there is also the possibility of late-Tertiary faulting on quite a large scale. Zones of utterly crushed and not at all reconsolidated rock are frequently met with during tunnel work and in some cases may be traced for miles upon the surface.



We seem to be able to discern two Tertiary surfaces, one probably elevated during the Miocene, the other during the Pliocene. The upper surface forms the elevated peneplain of the Jostedalsbre area at about 1800 metres (Plate 4). The Jotunheim group must have been mature mountains rising as much as 1000 metres above this peneplain in Miocene times (Plate 5). This was also the case with the Rondane mountains farther east, and in many places this pre-Miocene landscape was not a peneplain but maturely rounded hills, of which the Lofoten Islands are an example. The dating of the oldest recognizable elevation as (probably early) Miocene is mainly based on Alpine parallels, but this elevation certainly cannot be older or the surface would have been much more dissected in the highlands.

A younger surface elevated probably during early Pliocene is manifest as the extended *vidde* or high plain which in southern Norway descends from an altitude of about 1100 metres near the zone of maximum elevation to some 700 metres in the east. In a corresponding section the altitude of the older peneplain should decline from some 1800 metres to some 1300 metres in the

1. Ålfoten peninsula showing selective erosion in very hard Devonian sandstones and conglomerates. Jostedalsbre elevated peneplain in right background

2. Surface of the Archean east of Oslo fjord, with two intersecting zones of weakness ploughed by the ice sheet and filled with fini-glacial clay deposits

3. Stadt peninsula with old, glacially modified surface bounded by cliffs. This and higher peneplains in background may be of different generations

4. Highest (sub-Miocene) peneplain, elevated to 1800 m.; covered here by the thin sheet of the Jostedal glacier and cut into by radially diffluent glaciers

east, but there it has been almost entirely cut away by the sub-Pliocene peneplain and only appears as summits of hills rising above the *vidde*. This sub-Pliocene surface is a true peneplain peripheral to the "Miocene land."[1] Both these surfaces with their gentle outlines were formerly called the Paleic surface by Hans Reusch, and contrasted with the abrupt landscape forms due to more recent erosion (Plate 6).

Before the end of Tertiary times there must already have been a very great amount of fluvial erosion upon the recently elevated land, and during the Pleistocene glaciations these features were much accentuated by outlet glaciers from the Scandinavian ice sheet and from different western centres of glaciation, forming enormously over-deepened valleys, fjord lakes and fjords (Plate 6). This is what might be called the Norwegian type landscape, the

> "U-shaped valleys leading to
> Fjords that stretch their silvered blue
> Miles and miles out to the sea"

—a landscape unique in the Old World.

Where all flow was concentrated in a few outlet valleys, glacial erosion developed a tremendous force. In the Sognefjord there is a maximum vertical excavation due to glacial erosion of about 2500 metres. The Sogne fjord valley pattern is closely modelled upon that of the Tertiary fluvial drainage, a typical case of direction of glacial erosion; more frequently fjords have angular courses due to excavation along zones of weakness, but still with the fjords deeply cut below the old surface. From this type of fjord coast there is a gradual transition to that formed by an ice sheet moving over lowlands and effecting selective erosion, as over the surface of the Archean in south-eastern Norway (Plate 2).

Perhaps the most vigorous erosion is found where during long periods there was no continuous body of ice but many independent corrie glaciers. Such glaciers have split up or wholly destroyed mountain massifs. Very typical are the Jotunheim (Plate 5) and Lofoten (Plate 8) areas. In the Jotunheim there are all stages of development from the "biscuit-board" topography in the east, through grooved and fretted uplands to isolated Matterhorn peaks in the highest, westerly parts.

The work of corrie glaciers has proceeded very differently in different kinds of rock. In the easily shattered sparagmite of the Rondane mountains elongated finger valleys having flat floors with no real lakes were generally formed. In contrast to this "horizontal" erosion, the corries in the tough plutonics of Lofoten are short, with very deep lakes (up to 172 metres) in them—a "vertical" erosion type.

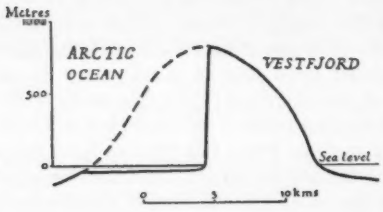
As was first recognized in Norway by the Austrian geographer Eduard Richter, corrie glaciers tend to work at certain levels, and as their back walls cut ever farther into the mountain massif where they occur, a horizontal or somewhat rising platform is formed which is frequently difficult to distinguish from an older peneplain. Where the inclination of the platform is opposed to

[1] The possible time intervals according to the most recent dating as given by Frederick E. Zeuner are: beginning of the Miocene, 30 million years ago; of the Pliocene, 14 million years ago; of the Pleistocene, 1 million years ago.

that of the peneplains, proof of glacial origin is given. But classification is frequently very difficult, the more so as many of these levelled areas have as their base the sub-Pliocene *vidde* from which the "corrie glacier abrasion" frequently started. Where the platforms cut into high mountains with a considerable rise towards the back wall as a kind of rock pediment, I have designated them by the Norwegian term *fly*. The results of corrie glacier abrasion are very much in evidence in the high mountain regions of southern Norway (Plate 7).

During the last glaciation there were no doubt many nunataks, especially where high mountains are situated in peripheral areas (Plate 9), and even during the most extended glaciation the island group of Røst may have been outside the continuous ice sheet (Plate 10).

The well-known and much discussed strandflat is probably also to some extent formed by corrie glacier abrasion, as recently strongly emphasized by Eilif Dahl, but levelling by marine abrasion is very much in evidence (Plate 11). One must remember that the strandflat cuts across fjord deeps and corrie lake deeps. Even if enormous amounts of material have been carried away by local glaciation (Plate 8), marine abrasion must be considered the formative agent. While there is practically no strandflat along the inner side of Moskenesøy, on the exposed side there is a submarine abrasion platform some 8 kilometres broad, cutting away the outer half of the original mountain mass so that, as emphasized by Thorolf Vogt, the high summits are now immediately adjacent to the ocean. The immense "spade work" of corrie glaciers on the inside (Plate 8) has, in contrast, only been followed by the formation of an extremely narrow fringe of strandflat. The tendency to stress glacial erosion comes especially from those who study the strandflat where an old plain of marine abrasion has been given a hummocky appearance through an overflow by inland ice during the last glaciation.



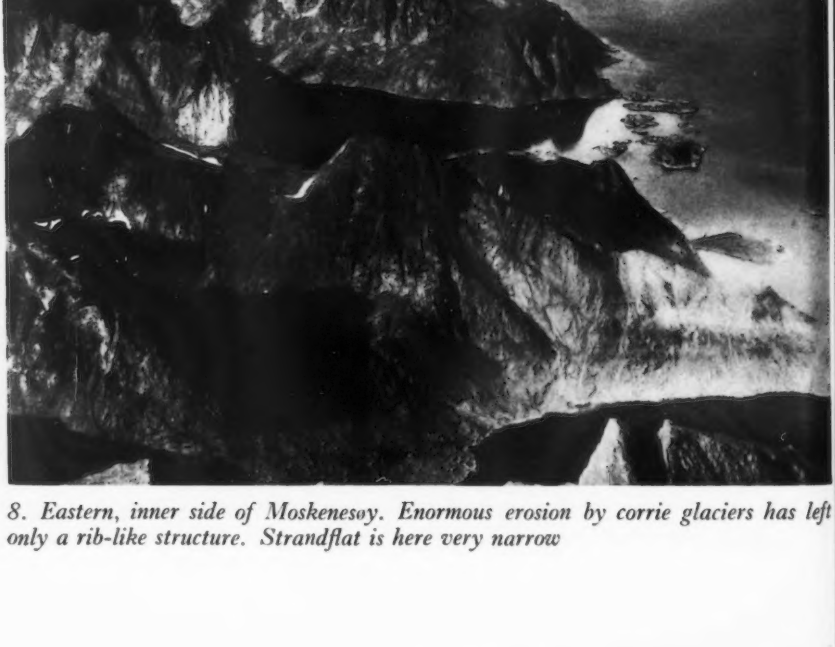
The sequence of events leading to strandflat formation may have been something like this: (1) An enormous amount of marine abrasion at successively lower and lower levels since early Miocene, with finally the formation of an abrasion platform during the last period of the Pliocene (a million years or more) when land had been elevated to about its present level. (2) A great amount of excavation by outlet glaciers from the inland ice, and corrie glacier abrasion during the various glaciations. Extended marine abrasion during the interglacial epochs and during the beginning and end of even the largest glaciation, cutting across fjord and corrie deeps, giving the outer strandflat its present character. (3) Overflow of the inner part of the strandflat during the last glaciation resulting in the peculiar glacierized features there. (4) Post-glacial marine abrasion in the peripheral areas where the changes of level due to isostatic recovery have been least.

It must be pointed out that the garland of islets (the *skjærgård*) existing

5. Skagastølstindene, formed by corrie glaciers eating into mature mountains, with present summits some 600 m. above Jostedalsbre peneplain, in left background

6. Naerøfjord, a U-shaped trough following a very broad pre-glacial valley in a high-level surface

7. Trollheimen, showing dissection by local glaciers. Only flat-topped mountains, left centre, still conform to sub-Miocene surface. Undulating surface in right foreground is corrie glacier abrasion level



8. Eastern, inner side of Moskenesøy. Enormous erosion by corrie glaciers has left only a rib-like structure. Strandflat is here very narrow

where the present sea-level coincides with the level of the strandflat, is different from that found along the coasts of south-eastern Norway, Sweden or Finland. This other skjærgård is found where the hummocky surface of the Archean grades downward into the sea, whereas the strandflat is essentially a horizontal cut into the land mass.

But the present surface of Norway has not only been formed by erosion; there are also vast accumulations of loose material. Very large morainic and glacifluvial deposits are found on the central *vidde*, especially in the areas that were situated between the watershed and the wasting ice sheet. Some of this material may belong to the glaciation before the last (fossils of mammoth and musk-ox from the last interglacial having been found) but it has largely been re-transported and re-sorted. Peripheral accumulations of morainic material and of sand and clay are very extensive. Along both sides of the Oslo fjord is a conspicuous ridge, the "Ra," similar to the Salpausselkä in Finland, laid down in the sea during an interlude in the wasting of the last ice sheet (Plate 12).

All illustrations in this paper are copyright Widerøe Aviation Company Oslo, except Plate 12, which is reproduced by courtesy of the Royal Norwegian Air Force.

DISCUSSION

Before the paper the CHAIRMAN (Mr. J. A. STEERS) said: I have the honour to introduce to you Dr. Strøm who on July 1 next will become Professor of Geography at Oslo. Dr. Strøm began his academic work as a biologist, and as a result of his study of lakes and related phenomena became extremely interested in geology and geomorphology. He has already given several lectures in England, including a course at Cambridge last year. In the late summer of 1947 he led a party of Cambridge geographers to the Jotunheim. Dr. Strøm has a wide knowledge of the geomorphology of Norway and I can say from the short summary he has sent to me that we are to hear a most interesting lecture.

Dr. Strøm then read the paper printed above, and a discussion followed.

Professor S. W. WOOLDRIDGE: I need not say how great a pleasure and privilege it has been to listen to Professor Strøm. It would not be fair to Professor Strøm or other speakers to raise a tithe of the questions which have come to my mind in the course of the lecture, and I will confine myself to one group of questions. I find myself especially interested in the older erosion surfaces to which Professor Strøm has drawn attention. I have always been a little sceptical, perhaps wrongly, about that sub-Cambrian surface. I do not know it in the rocks, but I have met with it on maps of the Stockholm region in connection with the work of my colleague Mr. Cornish. It is a slight shock to British geographers and geologists to conceive of the sub-Cambrian surface preserved in that degree of perfection. That is, I think, because we cannot conceive of such a preservation in our own country in view of the character of the rocks involved. I should like to ask Professor Strøm what is the full lithological difference between the presumed Cambrian deposit which rested on that surface and the pre-Cambrian material which forms it. Again, it is puzzling to geologists in this country that such a surface should be preserved in a comparatively flat attitude, having passed through the many vicissitudes of the Caledonian era. I

would not dare to question an authoritative opinion as to the age of that surface, but it is surely a feature of the highest interest, perhaps even unique.

It was with great interest too that I heard those high-level surfaces so confidently ascribed to Miocene date. Again, I do not doubt that that is a correct ascription, and I hope that some of my colleagues have drawn the moral that we in this country have developed a painful palaeozoic squint in our geomorphology. We underrate the duration and magnitude of the Tertiary erosion.

Finally it is clear that, whatever the age of these high surfaces, we must know a good deal about them before we approach the fascinating problem of glacial erosion. It has always seemed to me that my colleagues among glaciologists suffer one great disadvantage compared with students of normal erosion, namely, they do not know where they start; they seem to find it difficult to define the initial surface which has been subjected to glaciation. I can see that part of Professor Strøm's thesis was to indicate what were the initial surfaces from which ensued that perfectly marvellous series of glacier-sculptured landscapes which he has illustrated on the screen.

I will conclude by saying I have rarely enjoyed such a feast for the eye and such food for the mind as we have been privileged to have this afternoon in so short a compass.

Dr. STRØM: In regard to the sub-Cambrian peneplain, in many places in Norway we have shale deposits with Cambrian fossils in patches above this surface. As to the sub-Cambrian peneplain of the Hardanger plateau and the Oslo region, we can feel quite confident. Of course this peneplain has been tilted or deformed over large areas, but even then it can frequently be traced.

Mr. W. VAUGHAN LEWIS: I should like, first, to express my great pleasure in hearing again my friend Dr. Strøm, and in seeing those delightful slides of Norway. Dr. Strøm must have gone to great pains to obtain such a large and excellent collection of aerial photographs.

There were many interesting points on which I would like to touch, but I will confine myself to a few questions. Is Dr. Strøm prepared to commit himself as to how far out to sea the main ice sheets extended? I ask this because Professor Flint and others, in their maps, show the limit of the ice cap rather a long way out to sea if you are to account for the fjords. Dr. Strøm explained that in the Sogne fjord there may have been about 8000 feet of glacial erosion. That is a tremendous amount, but I agree, having been over the area, that it is difficult to envisage any very different alternative. Yet at the strandflat the floor reaches the present sea-level. The best way in which to account for this lessening of glacial erosion towards the fjord entrance would be to assume that over a very long period the glacier ended somewhere near the coast.

The peneplains are a tremendous problem, and it is encouraging to hear Dr. Strøm suggest that they are of Tertiary—perhaps late Tertiary—age. That must give particular pleasure to Professor Wooldridge, who has long advocated quite substantial vertical movements in the late Tertiary in this country. When you visit Norway you cannot avoid the view that there have been vertical oscillations on a very large scale, and recently when judged on the time scale for the evolution of landforms. Another point which Dr. Strøm so excellently brought out is that ice spread over a fairly flat surface is not able to wear this surface very substantially. On the other hand, ice resting on or against steep slopes may accomplish very great erosion. So it was most instructive to hear Dr. Strøm hesitating to suggest that the glaciers altered the flat peneplained surfaces, but elsewhere claiming that ice was responsible for great alterations to the landscape it inherited.

Dr. STRØM: It is difficult to say how far seaward the inland ice extended. In some places fjords are now cut across by the strandflat. Of course there may have been periods when the whole continental shelf was covered by some kind of ice. Personally I do not believe it. It is fairly obvious that the great downward erosion of the inland ice sheet and the valley glaciers did not proceed very far seaward. The outer Lofoten Islands were outside the continuous ice sheet of the last glacial period, as were also some of the other islands. I suggested that the strandflat must have been worked upon by marine abrasion, indeed, that marine abrasion may have been the most important agency.

Professor A. A. MILLER: I should like to thank Dr. Strøm not only for his clear exposition, in a language which is foreign to him, of the geomorphology of Norway but also for the remarkable museum pieces of topography which he has shown on the screen, such as we in this country never see. That topography is as sharp as an etching; ours is blunted by thousands of years of weathering and normal erosion, with outlines so soft and indistinct that their interpretation presents a very difficult problem to the geomorphologist.

I was comforted to see the conclusive evidence for the close correspondence between features such as fjords and valleys and lines of tectonic weakness in Norway. In a landscape which is not obscured by vegetation the lines of weakness are clearly recognizable, and the way in which the ice flow appears to have followed them is very convincing. I have often found it difficult to believe that a glacier could follow the bends in some of the Norwegian fjords and our Scottish lochs without breaking its back, but it seems that it is possible. I was most interested too in the way in which some valleys tip up at the sides and the minor watershed, so to speak, lies along the valley side. It is a reminder, on a much reduced scale, of what we see in the great rift valleys, a popular explanation of which invokes isostasy and subsequent readjustment. I do not know whether there is anything of that nature involved in this instance.

The subject on which I particularly wish to remark is that of peneplains. Like Professor Wooldridge, I first heard of a pre-Cambrian peneplain with a grain of salt, but when seen in the photographs they are remarkably convincing, especially as we are told that the monadnocks which project above them are all of Cambrian rocks and relatively soft. That is a remarkable tribute to the stability of Scandinavia, bearing in mind the proximity of the attack from the Atlantic side in the Caledonian earth movements.

The later erosion surfaces which are ascribed to Tertiary age tempt one to consider, very tentatively, correlations with our own country. Is there a possibility that some of these are connected, for example, with the summit peneplain of the Scottish Highlands at about 2500 or 3000 feet, gently inclined generally towards the south and east, which is there preserved only by the coincidence of summit levels of mountains rising to that general height? Beneath the high-level peneplain in Norway there is one other of the Pliocene with a step between. But in this country we have dozens of steps—a staircase of erosion levels, and every geomorphologist who studies them finds two or three more. The result is that there are "risers and treads" at every few hundred feet. Is there any evidence in the lower Scandinavian peneplains of stepping; that is to say, of successive erosion levels separated by steeper slopes? The greater height of these peneplains compared with their contemporary British analogues may, perhaps, be partly explained by the principle of isostatic recovery, but we have to remember that they are attributable to pre-glacial times and that presumably they had previously gone down by as much as they have subsequently come up if their present height is due to post-glacial recovery. I do not expect to get an answer to these questions, but I should like to know

whether there is any possibility of a correlation and whether there is any evidence of stepping of these surfaces.

Dr. STRØM: There is a possibility of correlation, but of course my mentioning only two peneplains was rather a simplification. It seems that on the western coast there may be a whole staircase, but it is difficult to follow. The maps are in part not detailed enough. Perhaps from an aeroplane one might see something of it, but even then one might easily be led astray.

Dr. N. E. ODELL: I should like to add my tribute of thanks to those already expressed. I much enjoyed the lecture by Dr. Strøm, who was my excellent host and chairman when I had the pleasure and honour of addressing the Norwegian Geological Society two years ago on the subject of northern Labrador and the structure and geomorphology of that country. The beautiful photographs we have seen this evening might almost be used as examples of the effects of glacial sculpture in that far northern tract of Labrador. There is a great deal of similarity between the two regions, as Professor V. Tanner (late of Helsinki) has described in his book, 'Outlines of the geography, life and customs of Newfoundland–Labrador.' Much detail, however, has yet to be worked out.

I should like to ask Dr. Strøm about work that has been done by O. T. Grønlie in northern Norway, published in his paper "On the traces of the Ice Ages in Nordland, Troms and the south-west part of Finnmark in northern Norway" (*Norsk Geol. Tidsskr.*, Bind 20, Årgang, 1940). As far as I recollect Grønlie mentioned that he had found evidence there of two glaciations, which in Norway, I think, is standard. Interglacial beds are also prominent. Is there any other evidence from southern Norway of more than two glaciations, say comparable to the three in Germany or the four of the Alps? In regard to the probable ice load of northern Norway, I think Grønlie in his paper of 1940 suggests that the thickness of ice sheet was about 2400 metres, and that the general depression of the land in consequence was probably of the order of 700 metres. I wonder whether Dr. Strøm has anything comparable in mind regarding the probable thickness of the ice cap in northern and middle Norway which at maximum may have extended out beyond the skjærgård. From such a huge "head" of ice in the interior there must, in different places and at varying stages, have been a great many fast-moving diffluent glaciers, as Dr. Strøm has cited. To these relatively swift ice streams, armed with ample hard abrasive from the crystalline rocks of the plateau, must be attributed the excessive erosion of the deep fjords in Norway, as in so many other comparable regions of former and augmented glacial occurrence. My views concur with those of Dr. Strøm in regard to the potentialities of fast-moving glaciers as agents of fjord erosion. Where however the ice sheet was static, as on the plateau, no erosion could have taken place.

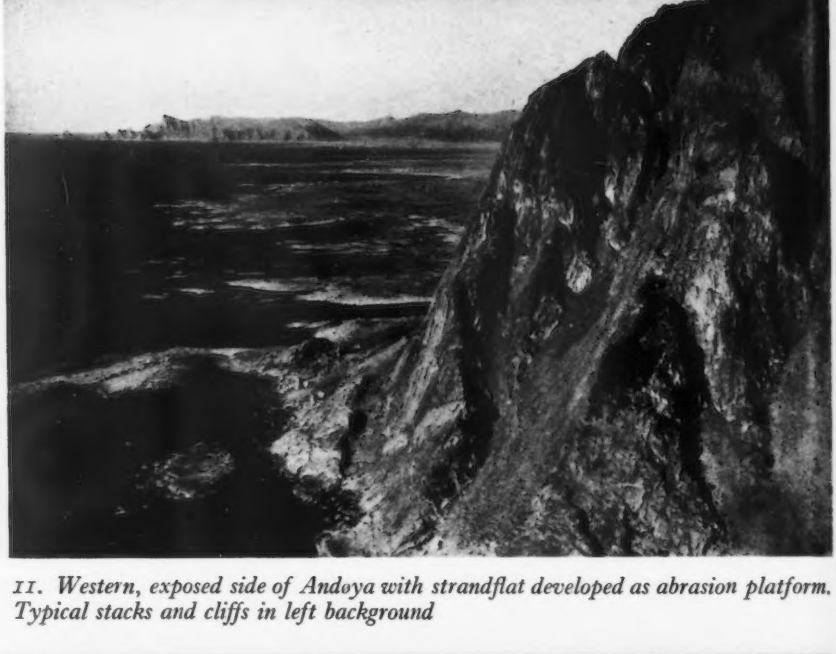
Dr. STRØM: It is not by any means easy to answer these questions. I believe Grønlie has estimated the thickness of the ice sheet, but nowhere in northern Norway can it have been as much as 2400 metres. That thickness may be possible farther east, perhaps in the northern part of the Baltic. There is no evidence in Norway for more than two glaciations. Those two glaciations are plainly marked.

Professor S. E. HOLLINGWORTH: I too should like to express my appreciation of the effective manner in which Professor Strøm has covered such a wide and absorbingly interesting field—part of which, in the Rondane area, I had the great good fortune of seeing under his guidance in 1946.

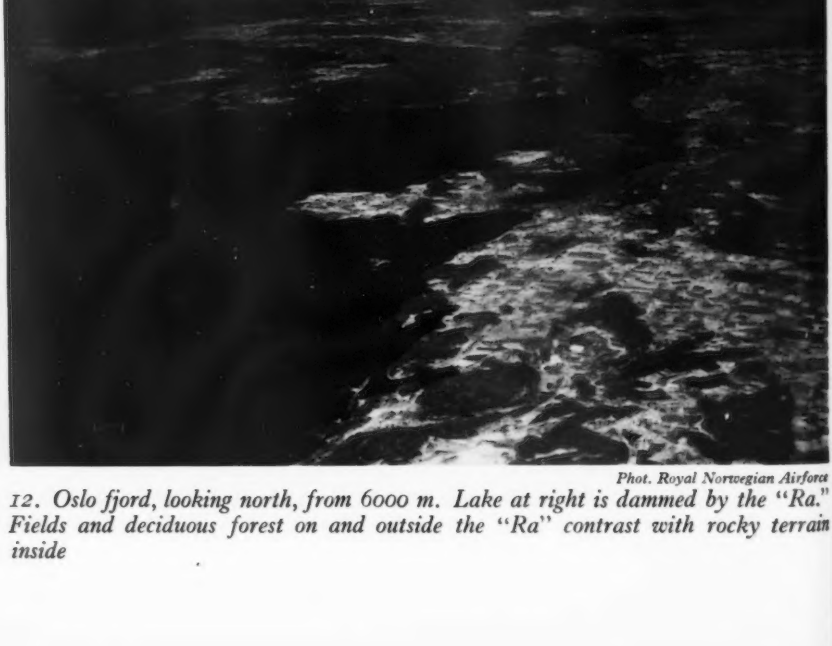
I should like to ask how far the period between the two glaciations could be called in to assist in providing time for the marine erosion required to produce the strandflat, since it would seem that the post-glacial time available was

9. Bjornskartind, a possible nunatak near Tromso

10. Rost Islands, outside the limit of at least the last glaciation. High island summits conform to Tertiary surface. Note broad platforms of marine abrasion



11. Western, exposed side of Andøya with strandflat developed as abrasion platform. Typical stacks and cliffs in left background



Phot. Royal Norwegian Airforce

12. Oslo fjord, looking north, from 6000 m. Lake at right is dammed by the "Ra." Fields and deciduous forest on and outside the "Ra" contrast with rocky terrain inside

inadequate. The possibility of stages in the uplift of the Tertiary peneplain being recognizable in the western coastal region has been mentioned in the discussion. I am a firm believer in the probability of periodic uplift as against a slow uniform movement. Geological evidence indicates that deposition in the epi-continental seas was controlled by intermittent or periodic subsidence of the sea floors as would be expected in the adjustment to loading and other forces acting on an earth crust of limited strength. Uplift is likely to have been correspondingly intermittent. We may hope that, in spite of the difficulties of recognition in a region such as western Norway, convincing evidence of their survival may yet be found.

I agree with Professor Wooldridge as to the regrettable tardiness with which the late date for the summit peneplains in Britain has been accepted. The evidence is as good or better than that of other regions where pioneer surveys, untrammelled by speculation of earlier workers, have resulted in a ready appreciation of large-scale regional uplifts of thousands of feet in Tertiary times.

Dr. STRØM: There may well have been more than two glaciations in Norway; and during not only interglacial but also interstadial periods the coast would have lain open to marine abrasion. During these very long intervals of time, sea-level must in general have been near its present position.

The CHAIRMAN: There are many questions I personally would like to ask, but it is not fair to expect Dr. Strøm to answer them now. It is clear from the discussion and the interest shown how much we have all appreciated this extremely lucid lecture. We congratulate Dr. Strøm not only on the excellent slides and on the way in which he has submitted his subject, but also on making it so plain in a language which is not familiar to him. I thank him on your behalf very much indeed, and I hope we shall not have to wait too long before he gives us another address.

THE MIDDLE PEOPLE: RESETTLEMENT IN CZECHOSLOVAKIA[1]

MRS. J. A. STEERS

THE COLLAPSE OF Germany has transformed European human geography in our time. "Mittel-Europa," that first principle of German geographical thought, has gone and with it a number of geographical concepts which had come to have more than a German significance. Partsch, amongst the Germans, was perhaps the most plausible exponent of Mittel-Europa with his invocation of regional technique.[2] His skilful presentation of the threefold rhythm of Alpine and Hercynian highland landscapes and of glaciated plain remains a classic in regional geography, despite the French disinclination to accept its argument. For the most accomplished regional geographers of our time, Central Europe never had more than a negative validity, being that part of the continent which is neither Northern, Southern, Eastern nor Western Europe.[3] It was inevitable, of course, that in such studies regional method should be coloured by political feeling, and from the Franco-German literature, in spite of its undercurrent of hostility, much of the grammar of European regional geography is derived. But now one source of energy for these studies has dried up. There is no "Deutschtum" any more, nor any need to make it convincing with a geographical background.

All German geographers recognized the striking position of the Czechs in Central Europe. Partsch spoke of the "clear and self-centred individuality of Bohemia." [4] He was reiterating in geographical terms Bismarck's famous but questionable platitude, "He who holds Bohemia holds Europe." But a sober analysis of the Czech settlement area makes one wonder what German scholars and strategists really meant beyond the need to explain the irritating length and strength of the Czech tradition.[5] That the Czech lands are conspicuous is undeniable. In the hysterical language of the Third Reich, they formed the "arrow pointed at the heart of Germany." But the physical details need study. After a while one is tempted to ask: is Bohemia really the mountain-walled bastion of popular imagination?

[1] This paper was read at the Afternoon Meeting of the Society on 23 February 1948.

[2] J. Partsch, 'Central Europe' (trans. C. Black), London, 1905.

[3] E. de Martonne, 'L'Europe Centrale,' *Géographie Universelle*, vol. iv, Paris, 1930.

[4] *Op cit.*, p. 214.

[5] Bismarck's epigram is, of course, largely contradicted by that of Joseph de Maistre quoted in Professor Seton-Watson's Inaugural Lecture, given at Oxford on 6 February 1946: "Bury a Slav idea under a fortress and it will blow it up." The Germans of the Third Reich thought out a gruesome solution of the Bohemian problem from the German point of view in two stages. First, in 1938–39 they made it clear that any independent political existence for Bohemia was incompatible with German strategic mastery of Central Europe. They could not develop continental hegemony without the complete command of Bohemia, and thus appreciated Bismarck's evaluation of this region. Later, they recognized the truth of de Maistre's remark, and the reaction was the plan to deport the Czechs completely. In our own time a new assessment of the worth of Bohemia, with the centre of political and economic strength moved to the east of the Czech lands, has become painfully clear.

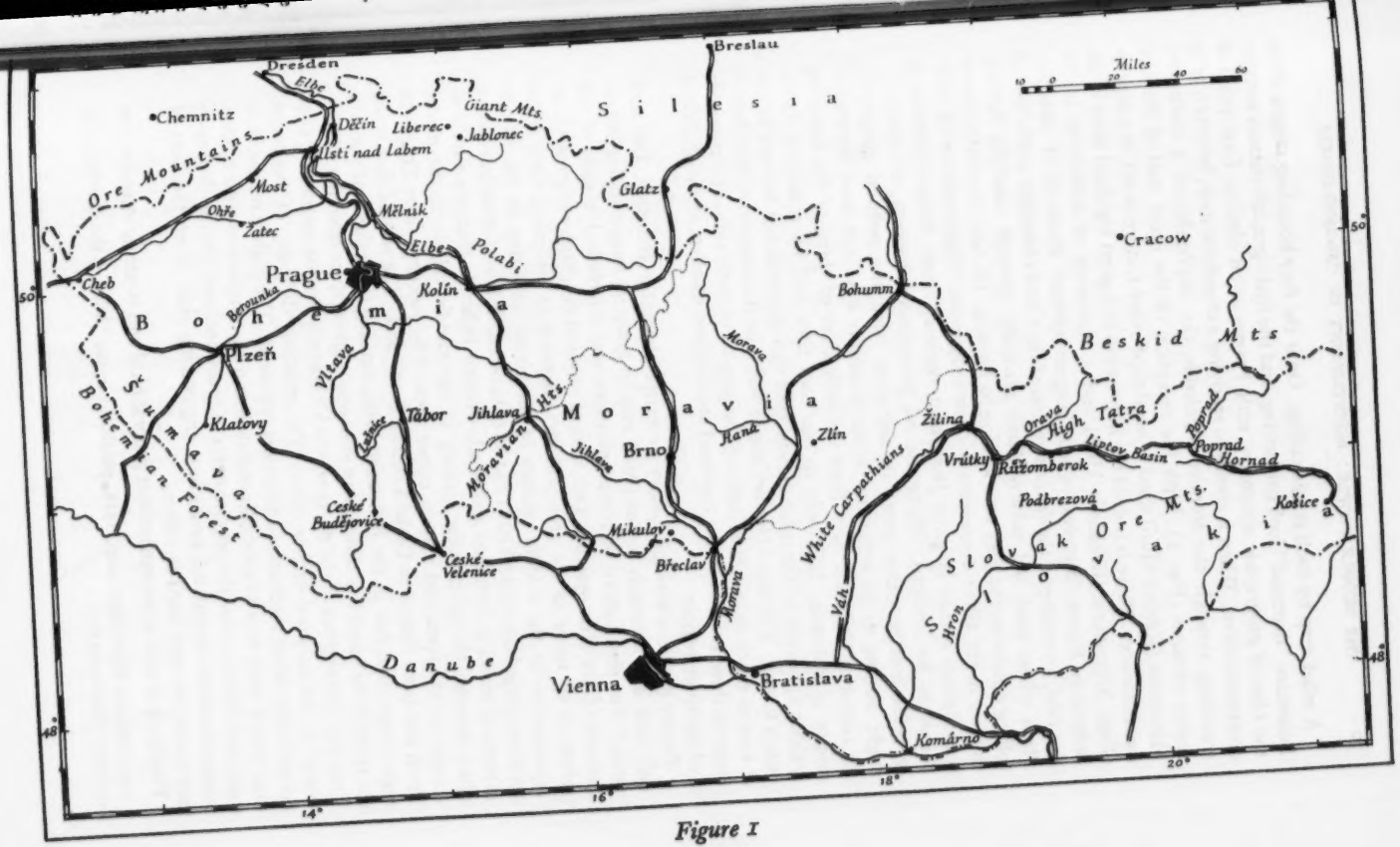

Dresden
Elbe
Chemnitz
Děčín
Liberec
Jablonec
Giant Mts
Silesia
Breslau
Miles
Ore Mountains
Ústí nad Labem
Most
Ohře
Žatec
Mělník
Elbe
Labe
Glatz
Cracow
Prague
Cheb
Kolín
Bohumin
Berounka
Bohemia
Plzeň
Vltava
Moravia
Beskid Mts
Bohemian Forest
Klatovy
Lužnice
Tábor
Jihlava
Hts.
Brno
Jihlava
Morava
Zlín
Žilina
Orava
High Tatra
Liptov Basin
Poprad
Hornad
Vrútky
Ružomberok
Moravian
Ceské Budějovice
Mikulov
Ceské Velenice
Břeclav
White Carpathians
Váh
Podbrezová
Košice
Slovak Ore Mts.
Slovakia
Hron
Danube
Vienna
Bratislava
Komárno
50°
48°
14°
16°
18°
20°

Figure 1

A relief map by itself is misleading. On it the four bounding ranges of the Bohemian "diamond" look convincing, and the hydrographic pattern conveys the idea of geographic symmetry with Prague as an obvious focal point of communications. When it comes to studying a structural map, however, or to travelling through the frontier highlands, the impression of a distinctive region weakens (Fig. 2). With the exception of the inner wall of the Ore Mountains (Krušné Hóri) there is no abrupt relief feature to act as a separative influence. There is indeed the impression of a great highland mass in the Giant Mountains (Krkonoše Hóri) and a scantiness of settlement in the Bohemian Forest (Šumava) which suggest natural frontiers of isolation. But take, for example, the famous region of the Chod clansmen south-west of Plzeň where road and railway climb gradually through carefully farmed, rolling upland to the easy pass leading to Bavaria. Or take the north-eastern frontier in the Glatz depression with its exaggerated fragmentation of landscape which occurs in some Hercynian regions, where frontier drawing is bound to be artificial. There are no pronounced barriers to movement or settlement in either area. In any case, what the political geographer might assume to be separative features simply have not been separative; for centuries Germans have lived on both sides of three of the bounding ranges of Bohemia. It is only in our own time and by reason of demographic upheavals of the most violent kind that Bohemia has become almost purely Czech. This fact of history might well raise the contention that there is at least as much in common between the peoples on both sides of a mountain range as there is between the highland and lowland dwellers of a well-defined hydrographic region.

Prague has been through history a centripetal point in Bohemia. One need only look at a sixteenth-century road map to grasp its long-standing importance.[1] But this pattern of communications was established in spite of, not because of, the river system. Two facts of physical geography impress themselves at all times in the transport development of Bohemia. One is the rejuvenation of the middle courses of the rivers, resulting in the narrow tortuous gorge beds of the Vltava and its tributaries. It is one of the interesting aspects of travel in southern and south-western Bohemia that one climbs so often through the spectacular scenery of the middle valleys to the milder scenery of the open and mature upper ones. The journeys from Prague to Plzeň and from Prague to Ceské Velenice are typical. The second fact is the high evaporation rate in the Bohemian basin, causing the volume of water in the rivers to be much less throughout than one might deduce from the rainfall. Thus the convergence of the rivers on the Vltava near Prague means very little except to the seasonal timber rafter. The resulting difficulty of movement became clear when mechanized transport appeared. The high-level medieval road routes were easy to establish and maintain in comparison with modern roads and railways, and the requirements of nineteenth and twentieth century communications stimulated precocious engineering skill. Even the lines of least resistance were hard to follow.

Finally, it is well to remember that geographical and strategic attention has

[1] See Mikulas Klaudian's map, 1518, published in the 'Atlas of the Czechoslovak Republic,' Prague, 1936.

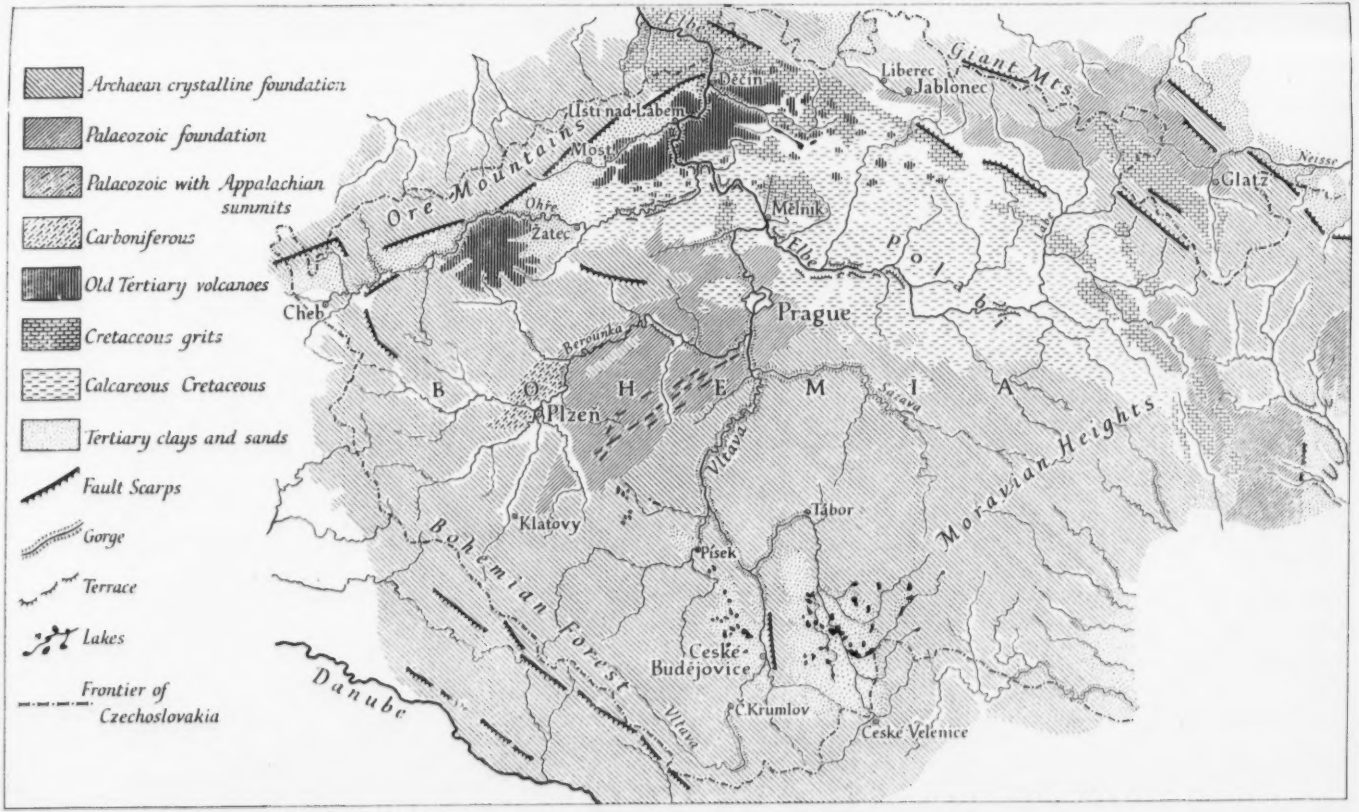
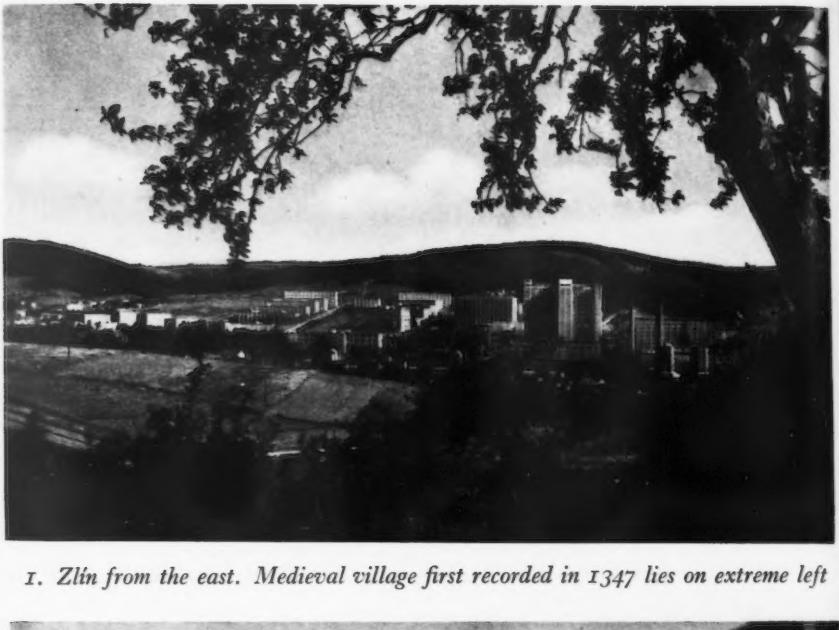


Fig. 2. Geomorphological structure of Bohemia. (After Emm. de Martonne.)



1. Zlín from the east. Medieval village first recorded in 1347 lies on extreme left

2. Silent houses in Žatec, Bohemia, once occupied by Sudeten Germans

concentrated on Bohemia. It is one thing to analyse and assess the character of the upper Elbe basin as a settlement area and an historic core of Czech development. It is another to realize that the regions of Czech speech include the famous throughway of Moravia–Silesia, and that experiments in state building in the twentieth century resulted in an attempt at symbiosis for Czechs and Slovaks. Such a straggling unit was beyond the flights of Bismarck's anxieties or Partsch's imagination, and it would probably have suggested to both a weakening of, rather than a supplement to, the strength of the Bohemian core. It seems indeed that the Czechs have survived an environment in which position throughout history has been something of a threat and in which there are considerable tactical and economic weaknesses in detail.

These comments are in no sense deprecatory. A very little journeying in the Republic convinces the traveller of the "clear and self-centred individuality" which impressed Partsch. No historical geographer could ignore, for example, the value as a nuclear area of Polabí with its long tradition of prosperous farming and its ease of movement from earliest times. Such a region must be a positive source of strength to any young state whether in medieval or modern history. But this association of a people with a core of riverine lands is repeated constantly in European history. The little Baltic groups of the Daugava and Niemen show the astonishing survivals of settlement and identity in such an environment, until the devastating policies of the mid-twentieth century were evolved to transform the ethnography of Europe. Imaginative geography, however, has bestowed upon Bohemia the distinction of a frame, and this supposedly separative feature has received much more attention than the solid feature of a good centre. It has become an obsession which has prevented an accurate assessment of the country's qualities.

Since Central Europe as conceived by modern geographers has gone, the residual groups stand uncomfortably in the limelight. The Benelux countries, Switzerland and, in the hopes of many Europeans, Czechoslovakia survived to inherit the rôle which the Germans, had they proved good Europeans, could have filled magnificently by reason of position and ability. The Czechoslovaks particularly were in the public eye because of their tragic connection with the past struggle and their link with the new forces in Eastern Europe. Their activities were treated as the barometer of the condition of Europe, whether in their attempt to establish solidarity within the state, or in their picking of a way through the jungle of international relationships. The whole world watched intently their recovery from war damage, their production drive, the attempt to retrieve the very painful situation in Slovakia, and the modern orientation of Czechoslovak trade.

Such a study of the Third Republic might run on purely political lines, quite unsuited to a geographical paper. But much of what is happening is reflected in the landscapes of Czechoslovakia. The question of position is once more of critical importance, and public interest, whether consciously or unconsciously, has been riveted upon Czechoslovak manipulation of natural and other resources.

The outright material damage of war was enormous. The attacks on the Škoda works at Plzeň are of course well known, for the great armament

factory was an obvious target. Just as inevitable were the raids on the industrial north which largely ruined towns like Most and Ustí-nad-Labem. What impresses a traveller more, perhaps, is the extent of destruction in the rich agricultural district of the Haná in Moravia, in the neighbourhood of the great airfields. There, in an area of markedly nucleated settlement, the heaps of débris in the villages look incongruous beside the trim prosperity of the fields. The south of the Republic, right from east to west, also suffered very noticeably from the final campaigns of the war. In the west the Americans poured across the frontier mountains after the retreating Germans and there are signs of the struggle, for example, in the ruined stations of Cheb and Klatovy, in the wrecked houses of the picturesque little towns and villages of the Šumava foothills and in more than one roadside memorial put up by local survivors to the American dead. In the heart of Bohemia, Prague was tragically damaged during the climax of the Revolution in the last days of the war.

In the east the Germans were pressed by the Russians and Rumanians and the damage from campaigning is much more obvious. In the neighbourhood of the old south Moravian stronghold of Mikulov, for example, there is a region of ruined villages now slowly coming to life again. Throughout, the wayside heaps of rusting war material, tanks, lorries and railway rolling stock, the sporadic dumps of scrap in the forests and on the hillsides constantly serve as reminders of violent fighting. But much more spectacular than the destruction to housing is the result of the German mining of the road and rail bridges. Throughout the greater part of Slovakia and much of Moravia the stone, concrete and iron bridges of the old Empire and the First Republic have gone, including the great bridge over the Danube at Bratislava. The devastation is most striking on the Danube and Váh because of the strength and turbulence of these two great streams. Much has been done in the way of temporary repairs: the Russian-built bridge over the Danube at Bratislava brought an early renewal of north–south traffic, and throughout the eastern part of the Republic the trains creep cautiously over makeshift wooden bridges. But a very important and expensive factor in the communication system was destroyed, and its replacement has added considerably to the huge task of rehabilitation.

In the same category of loss is the wrecking of the Danube navigation channel. The use of this great waterway has been cramped throughout history by a variety of natural and man-made difficulties,[1] and at no time in the history of the First Republic did the volume and value of traffic on the Czech Danube come near those on the much smaller Czech Elbe–Vltava system. But Bratislava was developing as a river port, and also Komárno with its traffic in Polish coal and Rumanian petrol. During the war the middle and lower Danube channel was mined by the Allied air forces and this checked the usual dredging operations. The channel has now officially been cleared, but there is still danger at low water. Dredging remains in arrears and these prolonged hindrances to shipping have withered away the water-borne transit trade of Bratislava and have almost killed commercial life in Komárno.

In addition to the problem of outright devastation there is that of the wear

[1] H. Ormsby, "The Danube as a waterway," *Scott. Geogr. Mag.* 39 (1923) 103.

and tear of an enemy occupation. This has been carefully analysed in various official publications [1] and from them one can judge something of the fearful toll on natural resources and on manpower. For the geographer the most apparent damage of this kind has been to the forests. The forestry of Czechoslovakia is a subject to itself, and it is possible here to give only a summarized account of its circumstances. The most casual traveller will be struck by the contrast in forest covering between the west and east of the Republic, with the boundary running through eastern Moravia. To the west lie the mainly coniferous forests of the Czech lands, very reminiscent of parts of Germany. They are for the most part on poor upland soil, and are almost entirely managed forests in which a cycle of planting and felling has been operative for generations. From this great natural resource many forms of manufacture and trade draw their strength.

The forests of eastern Moravia and Slovakia are largely deciduous. Beech predominates and oak in the extreme south, although there are big coniferous stands in the Tatra mountains. These are still to a great extent virgin forests, with a vigour of growth and reproduction unknown in Bohemia, thanks largely to much richer mountain soils. The problem of conservation here is that of the relationship between forestry and destructive, small-scale pastoralism.

The long-standing problem in exploiting Czechoslovak timber is that of distance from the sea. In northern Europe and in Rumania, access to the sea and to the timber buyers is comparatively simple, and the Czechoslovak traders have always been at a disadvantage. Even in the middle Danube basin, Austria and Yugoslavia are normally strong competitors. It is only in times of acute timber shortage that the Czechoslovak forests have a continental value. But the Czechoslovak position in the present timber boom is exasperating. The German felling in the frontier forests of the Czech lands was merciless and took four years' yield in addition to the normal felling. It is conservation that is needed now rather than another bout of felling and marketing, both from the point of view of restoring timber resources and for the less obvious but equally important need to prevent erosion and regulate run-off. Travellers will note the ravages of bark beetle, the stripped hillsides and the many plantations of young trees. They will, of course, also watch enviously the hundreds of busy timber yards and the great freight trains carrying wood all over the country. A timber shortage hardly seems credible. But the fact remains that when the home market has been supplied, the amount available for export will be limited for some years. Irresponsible cutting during the occupation has temporarily exhausted one of the best of the Republic's natural assets at a boom period, and the problem is aggravated by the lack of foresters (see p. 36).

The Czechoslovak government announced its Two Year Plan to its people and to the world as the foundation for recovery. In every factory and public building hangs a pictorial analysis of this effort, that of a people with a long tradition in, and dependence on, manufacture and trade in spite of the big peasant element in the population. In the struggle to make the plan practical politics, the problems which impress a foreigner most are those of the

[1] See the many publications by Orbis, the State Publishing Office in Prague.

disappearance of the Germans and the extent of nationalization. Two and a half million Germans have been thrown out from their compact settlement areas on the frontiers of Bohemia and from the "island" settlements of the interior and farther east. It could not have been otherwise. No one can travel through the Czech lands to-day without grasping something of that terrible intensity of personal and national suffering which will make the years between 1938 and 1945 in many respects the blackest in Czech history. Therein lies a partial explanation of the instinctive orientation eastward as the war drew to a close. The Germans, with the exception of very small groups of proved political loyalty, could not stay and the settlement pattern of the Historic Provinces, which has the tradition of centuries behind it, has thus altered completely.

The visible effects are various. Depopulation is much less obvious in the country than in the towns. There is talk of land lying fallow, although it is not as easy to detect it as is sometimes assumed. There is a noticeable labour shortage also in the regions of established farming like Polabí and the Moravian Haná because of a centrifugal migration. It is, moreover, significant that the legal limitation to the size of property has been relaxed in the frontier regions.[1] But at first sight, at any rate, a vigorous outward move appears to have taken place. Villages which were wholly or partly German are now wholly Czech. In some places the revival of specialized farming is impressive; for example, that of viticulture in the neighbourhood of Mikulov.

The condition of the towns is hard to assess. So many of the previous German settlements were raided and bombarded that there is no easy distinction between damaged and abandoned buildings. But secondary towns like Žatec have a slightly uncanny atmosphere with so many silent houses, and with such thin coats of colour-wash that the announcements of the German past form a ghostly background to the Czech present (Plate 2).

Statistical evidence will show that the loss in labour has been made good, but there is general agreement that the new population is as yet quantitative rather than qualitative in value. Indeed, the economic problem arising from the German evacuation has been acute. The Czechoslovaks, faced with the need to produce as much as possible as quickly as possible, lost a large proportion of their skilled labour, and this shortage is the more conspicuous because the Germans had previously destroyed the majority of the Jews. Their absence from the towns strikes anyone who travelled in Czechoslovakia between the two wars.

The forms of production most deeply affected were agriculture and forestry, and in manufacture, the textile, glass, porcelain, mining, brewing and chemical concerns. The hotel industry of the frontier areas also suffered noticeably. In terms of geographical distribution, the former German predominance in the farms of rural Silesia and in southern Moravia became obvious; likewise the traditional German responsibility for the cotton goods of Liberec and the glass marketed at Jablonec, for the porcelain ware and the lignite mining of the north-west, for the great chemical factories at Ustí-nad-Labem and for the whole complex life of the Elbe valley between Mělník and Děčín. It is a measure of Czech loathing of all things German that they

[1] This relaxation is difficult to harmonize with the existing stringent renewal of Agrarian Reform.

should in such circumstances have expelled so large and skilled a labour force without the slightest hesitation.

The attempts to make good this loss in labour supply are extremely interesting. There has naturally been the outward flow of settlement, both urban and rural, mentioned previously, which brought the Czechs for the first time right up to the fringing mountain regions in Bohemia and into the extremity farming lands in Moravia–Silesia. On the land two palliatives are generally cited: first, an increase in mechanization and, secondly, the import of foreign labour. The creation of fresh holdings certainly suggests an opportunity for establishing modern farming methods, but so far there is not very much in the way of machinery apparent to the ordinary traveller.[1] One can drive for hours or walk for a good many miles in the border farming regions and see *a* tractor or *no* tractor; much more obvious are the scores of busy peasants behind the ox-drawn or horse-drawn ploughs.

In the fields here and there are the immigrant workers, mainly Bulgar and Rumanian. The Bulgarian market gardeners are, of course, no innovation.[2] They have a long-standing place in the farming systems of East Central Europe, comparable to that of the Danes in England, although naturally with much lower standards of living and production. But six thousand fresh immigrants from Bulgaria came into the Republic between November 1946 and March 1947, and contracts were offered later in 1947 to a further two thousand five hundred.[3] Another fifteen thousand workers were expected from Rumania and two thousand from Italy. Little groups of foreign labourers are therefore a common sight on the roads and railways, standing about rather forlornly on the station platforms awaiting direction. They drive home the conviction that the standard of living amongst the peasants in the Czech lands (not the Slovak) has been for generations substantially higher than that of the surrounding peoples to the north and east. It is of course too early to see the proper pattern of farming in the borderlands. Everything needed for development, including farming machinery and petrol, is in short supply, and a temporary drop in yields might well be expected even if the essential prerequisite of political contentment were assured. The long-term effect on farming of the huge upheaval in settlement remains to be seen.

The situation in Slovakia is interesting by way of comparison. Here over six hundred and fifty thousand Magyars were included after 1919 within Czechoslovak territory, and the vast majority were peasant farmers. The instinctive policy of the Czechs towards the Magyars since 1945 was the same as that towards the Germans. The Magyars did not prove a loyal minority and they must therefore go. Thus in the middle Danube basin, as in Bohemia and Moravia–Silesia, it seemed as though the pattern of settlement established in the early Middle Ages would be transformed. The change had indeed begun long before, since the Slovak birth-rate is much higher than the Magyar, and by the end of the nineteenth century the Slovak peasantry

[1] It was difficult in the autumn of 1947 to judge fairly of Czechoslovak farming owing to the results of quite abnormal drought.

[2] J. Král, 'Das Leben der Bulgarischen Gemüse Gärtner in der Umgebung von Bratislava,' Bratislava, 1936.

[3] Živnostenská Banka, monthly report, Prague, September 1947.

through sheer weight of numbers were beginning to press down from the fringing highlands to the Danube plains. The two world wars speeded up a process which had already become noticeable. But the question of the Magyars' departure has been different from that of the Germans'. The Magyars were not immediately intolerable, and the violent development of Communism in Hungary with its accompanying agrarian reform was bound to colour the situation. Thus a system of exchange over the course of time was planned, by which the Magyar minority in Slovakia is being replaced by the Slovak minority in Hungary. The more gradual evacuation and the transference on both sides would largely solve the problem of vacant farming lands which troubles Bohemia and Moravia–Silesia. The actual effecting of the exchange depends for the time being on political circumstances.

The problem of replacing German labour in the forests has been somewhat different from that in the farming regions. Officially forest land, like farming land, was subject to the sequestration laws of 1919, but in practice Land Reform affected the forest properties much less than the agricultural. This moderation came from economic necessity. The fragmentation of forest land could only have meant the loss of it as a national asset. The amount which the state could afford to take over was limited (about 20 per cent. of the whole) and there were strong arguments for leaving the forest owners largely undisturbed, especially where the standard of management was high. The survival of much of the Schwarzenberg forest estate in the Šumava highlands is a case in point, and it is difficult to see the practical politics of the present demand for expropriation to the uttermost extent. Since the forests were largely frontier regions, however, something like thirty thousand acres of forest land were made over to the Ministry of Defence. In these regions the traditional German minority had in some cases already been replaced by Czech foresters, largely for strategic reasons. As a result of population movements, the question of forest ownership had come up again before the Communist revolution, but all that was clear was that up to 1948 the proportion of state-owned forest land had increased (to 43 per cent.) and that the shortage of foresters was severe. It is not as easy to recruit suitable foreign labour for forestry as for farming.

Immigration is a partial solution to the industrial crisis, but of a rather different kind from that associated with farming. Slovaks and Magyars have in some cases moved westward for the roughest kind of manual labour in quarries and brickfields. Some Magyars have thus chosen to remain in the Republic, but the Slovak movement westward for industrial employment is not popular in their country of origin. For skilled work the main hope in immigrant labour lies in the Italians. Italian miners are making good a part of the lost German labour in the lignite regions of the north-west, and Italians are coming also in the traditional capacity of stone-cutters. Foreign labour is perhaps most evident in the Bat'a factories at Zlín (Plate 1) which form, indeed, something of a Tower of Babel. But Zlín is peculiar in Czechoslovakia, peculiar almost in Central Europe.

One cannot altogether dissociate the rapid process of nationalization from the German exodus, but it would not do to labour this point. It is enough to say that the extent of rehabilitation needed in the Third Republic, together

with the problems accompanying the expulsion of the Germans, explain a good deal of the policy of the Two Year Plan quite apart from the present political exigencies.

Finally, the development of nationalized industry forms an important part of Czechoslovak policy in Slovakia. The sore question of Czechoslovak relations is baffling in its complications, many of which are purely political. The position of the Roman Catholic priests in Slovakia and the unwholesome past of German–Slovak relations do not come into a paper of this kind. But a part of the Slovak question is explained in the landscape of Slovakia: in the agrarian problem and the attempt to solve it.

The standards of living and farming amongst the peasants begin to drop on the eastern side of the Morava. Slovakia begins in Moravia literally and metaphorically. Slovak speech is widespread on the outer ranges of the White Carpathians and Beskíds, and there is a greater contrast between the farmers of the eastern Moravian Heights and those of the western Carpathians than there is between the peasants on either side of the Moravian–Slovak frontier. But the middle Váh valley is in many respects another borderland, and it is north and east of Žilina in the Liptov and Poprad basins and in the Orava basin that the dreariest problem of Slovakia becomes evident, that of deep-rooted and demoralizing agrarian poverty. It is repeated, of course, many times in the upper valleys of the south-flowing rivers, especially in the Hron and Hornad basins. There was in the First Republic no real solution of the difficulties of small farming plots becoming smaller with sub-division by inheritance, and of inefficient and conservative farming methods. There persisted the fluctuating element of unskilled peasant labour available, especially in bad farming years, for such industry as had taken root, and acting as dead weight against a rise in wages except for skilled artisans. Travelling through the regions of primitive farming in Slovakia, one comes to the edge of the great swamp of peasant misery in East Central Europe in which many hopes of political stability and material well-being between the two wars were drowned. Here lies one explanation at any rate of the threatened division of Europe into east and west. Here is the most fertile breeding ground of that uninstructed, "one syllable" Communism, which is different from that of the urban proletariat and which is being manipulated with such terrifying effect.

One should record, of course, the conscientious energy of the Czechs in the twenty years of the First Republic in trying to find a way out. The tragedy was that Czech policy could not be effective in the circumstances of the times and that the effort itself was so little understood and appreciated. The Czechoslovaks inherited a Magyar pattern of industrial enterprise which had temporarily absorbed a good deal of peasant labour. The most conspicuous features of it were the working of the minerals in the eastern part of the Ore Mountains, especially the iron; the development of the food processing industries, and the opening up of the coniferous forests of the north. But the outlook for all of them during the inter-war period in a small and over-industrialized republic was problematical enough, and mining and metallurgy particularly began to flag. What the Czechoslovaks developed as additions to Slovak economic life—the river ports of Bratislava and Komárno, and the

systematic beginnings of a tourist industry—were sound enough in policy but not ample enough to relieve the hand-to-mouth character of Slovak farming.

Thus continuous wretchedness in the east as in the west played its part in destroying the First Republic. Another phase of spurious development followed in the period of German coddling of Slovakia during the Second World War. Finally, the enterprises of the Third Republic are in the process of appearing and have a special character. In a national plan, it is possible to initiate Slovak industry as capital development, and as such it stands distinct from the rehabilitated mining and manufacture of the west. The fourth stage of Slovak industrial life, given political quiet, could have a suitable relationship to local labour supplies and purchasing power.

This development of industry in successive phases during the last seventy years is interesting. Peasant poverty is still painfully evident. The endless lines of little wooden steep-roofed houses predominate in the Slovak countryside, backed by the ribbon-like scraps of tillage and the ominous amount of fallow land. There is still the contrast in peasant appearance between the Sunday finery and the unattractive rags of everyday wear, and between the villages on and off the tourist routes. But a change is perceptible which is slightly comparable to that in some of the remoter parts of Scotland. The high-level dwellings are largely abandoned and the decline in transhumance is in itself a sign of alternatives to mountain farming. Rural housing is altering by degrees and the old wooden huts, like the Scottish "black houses," are becoming byres or hen-houses or toolsheds. The factories still look incongruous, especially when they are in isolated sites away from the upland towns; the Bat'a settlement near Poprad is the most startling, a reproduction in miniature of the Zlín model, even to the dotting of "tied" houses (for workmen only) around the workshops.

There is evidence then of another attempt to relieve material poverty in Slovakia, but the outcome of the Two Year Plan there is hard to forecast. The most needy element in the population is still too inarticulate for its views to come easily and accurately to the outside world, and in any case the traditional complications of Slovak life are overshadowed now by the power and proximity of the Russians.

American greetings in Slovakia were frequent in the autumn of 1947. They came from two kinds of Slav travellers. On the one hand were American citizens of Slovak origin, back on short visits to friends and relatives. On the other were Ruthenes from Sub-Carpathian Russia, also American by birth, withdrawing with few words but many gestures from the Soviet régime. They were struggling to get as many members of the family as possible back to the States. Both types serve to remind travellers of important cross-currents in Czechoslovak affairs; the unforgettable past of mass Slav emigration to the New World up to 1914, the extent to which emigrants' earnings returned to the region of origin, the number of emigrants who came back after 1919 to the altered Europe and spent savings on small or medium holdings, the nightmare of realizing that a generation of struggle was thrown away, the despairing decision eventually to get back again to America. One should not underestimate the American element in Slovak discontent, nor the extent and complication of Slav interests on the other side of the Atlantic.

It is too early yet to see the revised pattern of trade relationships. Czechoslovakia now as before the war is immensely dependent on trade; and commercial links have to be recovered when and where the chance occurs. The trading list of Czechoslovakia for the first six months of 1947[1] is interesting; the nine leading trading states are tabled here. In the continued list of twenty-eight states, Hungary comes seventeenth, Austria nineteenth, Poland twenty-third and Germany twenty-sixth. From such statistics various deductions are possible. The trade with Germany has gone, and although some recovery is probable in the long run, the importance to Czechoslovakia of the German commercial relationship will never be what it was in the years of the First Republic. What shall take its place? In the immediate future, it seems, West Central, North-West and North Europe as well as a noticeable connection with the United States. The Benelux area is clearly important. The volume of trade with the Netherlands and Belgium combined is greater than that with any other trading unit, and the balance of trade is steady. Visits to factories like Bat'a and Hardmuth produce evidence of trade links farther afield. One learns quickly of the importance of American cotton and cedarwood, Argentine hides, Nigerian rubber, and Ceylon and Mexican graphite. It is plain that the first recovery of trade with the west and with the New World is in process and such exchanges also seem indispensable in long-term reckoning. The restoration of western trade is also reflected in a partial resumption of the Elbe traffic and in the repair to the Czechoslovak trading zone at Hamburg.

	Import	*Export*
	(*millions of Kčs*)	
Switzerland .	1132	1513
U.S.A. . .	1813	635
Great Britain .	1388	697
Sweden . .	852	1181
Belgium . .	758	886
Netherlands .	780	996
U.S.S.R. . .	427	601
Turkey . .	667	304
Yugoslavia .	357	697

From the trading list it is clear that the relationship of Czechoslovakia with neighbouring states remains feeble. That with Russia suggests a discrepancy just now between political and economic links. But one should reckon on considerable changes in the course of time. The economic interdependence of Czechoslovakia and Hungary, for example, seems obvious enough, and the manufacturing and trading maturity of the Czechs should be an asset to all East Central and South-Eastern Europe. The immense resources of Russia eventually also must tell. It is the U.S.S.R. which, when the ruin of war is repaired, must largely take the former place of Germany in East European trade. The present limited exchange reflects the extent of war damage to communications and manufacture rather than the absence of trading possibilities. Such a development might well lead to intensive use of the Danube waterway, so that its natural assets of length and volume would at last become apparent in its traffic.

What we watch at the moment is the determined effort of a patient and ingenious people, bent on economic recovery, to seize trading chances wherever these appear. Meanwhile, the scars of a violent struggle are still more conspicuous than any fresh design for living.

[1] Živnostenská Banka, monthly report, Prague, September 1947.

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DISCUSSION

Before the paper the CHAIRMAN (Sir JOHN CHANCELLOR) said: I have the honour of introducing to you Mrs. Steers, lecturer in Geography at the University of Cambridge. Mrs. Steers has recently, through the action of the *Geographical Magazine* trustees, been able to visit Czechoslovakia to study geographical conditions. She will, during her account of what she has seen, describe the present conditions of the "Middle People," the people of Czechoslovakia, and their prospects for the future. Her lecture will be purely factual; that is to say, no political party views will be mentioned.

Mrs. Steers then read the paper printed above.

Professor W. GORDON EAST: It will be within the recollection, I imagine, of all of us how just before the last war our Prime Minister said that Czechoslovakia was a distant country of which we knew little. It is rather paradoxical that in a world which has now been completely discovered the parts which are least known, the real *terra incognita* of our time, lie not so very remotely from our own shores, in East and Central Europe. You will agree with me therefore that it is very appropriate that Mrs. Steers should have revisited Czechoslovakia and should have come here to report to us on her discoveries. You will agree also that she has studied it with very open eyes and discerned much which she has now related to us. Mrs. Steers has had the advantage which few of us, including myself, have had, of visiting this scene recently, and the few remarks I would like to make therefore are by way of comment on some of the more general points which she raised.

It seems to me that one should not get an exaggerated idea of the war damage in Czechoslovakia. President Beneš himself spoke of it as relatively not very considerable, and I imagine that compared proportionately with the damage suffered in areas such as White Russia, the Ukraine and North-Western Germany, Czechoslovakia came through the war relatively well in respect of physical war damage.

I want to react a little to the general point Mrs. Steers made early in her lecture when she told us *Mittel Europa* had gone. If I understood her rightly, she meant that the idea of Central Europe or Middle Europe as "Germandom" had gone. With that I think we would all agree. The Germans have ceased to dominate those regions. Their actual distribution has changed considerably as they have been moved from areas now occupied by the Poles in East Prussia, Silesia and elsewhere. They have been moved too from Czechoslovakia. Nevertheless, if the German *Mittel Europa* has gone, Central or Middle Europe remains and must remain as a permanent fact because it rests on the physical structure of the continent, however we define it—and it is a nice question what is the exact delimitation of Central Europe. One geographer, Partsch, defined Central Europe in relation to three contrasted zones of country: the plains of Northern Europe, the highland zone and the Alpine structure to the south. Sir Halford Mackinder too found reason to distinguish a middle or transitional area in Europe, fronting the inland Black and Baltic seas, between the maritime Europe to the west and south and the purely continental area which stretches east of the Volga. So that if *Mittel Europa* as Germandom has disappeared,

Central Europe is still with us, though significantly changed in its political content.

Mrs. Steers called the subject of her lecture "The Middle People." That emphasized this point. The Czechs and Slovaks have to a large extent now ceased to be surrounded by Germans, but they remain "middle people" nevertheless, finding themselves surrounded on two sides at least by Russian occupation forces in Germany and Austria. They have acquired too, as a product of the war, a stretch of frontier with the Soviet Union between Slovakia and the Ruthenian area of the former Czech Republic which has passed to the Soviet Union. So probably as time goes on we shall find that Central Europe, having ceased to be *Mittel Europa*, has become Soviet Central Europe. Indeed, President Beneš himself, having defined Central Europe, curiously, in a way that excluded the Germans within it, now finds that the Russians are part of it because of their extension westwards, as a result of the war, into Ruthenia and eastern Germany. "The Middle People" are still very much the middle people, so they provide an extremely sensitive index to the European international situation.

There is one other point on which I react a little from Mrs. Steers. She called attention to the way in which geographers have exaggerated the mountain framework of Bohemia. I suppose it is true that there we have been obsessed by the map. Cartographically it looks so bold and so simple. Nevertheless, I suspect that this broad zone of highlands and forested country had a striking effect in preserving the Czech and Slovak peoples from complete submergence by the advancing stream of German colonists. Recalling the map of this German movement eastwards, it would be true to say that the existence of this mountain framework did in fact divert and canalize the flow of Germans from the West towards Middle and Eastern Europe. They moved along the Baltic, along the north German plain and down the Danube, but the mountain framework of Bohemia arrested their movement, and it was rather later (the eleventh century onwards), and partly at the invitation of Bohemian kings, that the Germans came into those frontier wooded areas of the mountains and slowly filtered through the mountain rim. They were not in any sense a barrier but I suggest that they afforded an effective frame to the Czechs settled in the Polabí area which was doubtless their essential homeland.

May I, in conclusion, express my gratitude to Mrs. Steers for an enjoyable and stimulating lecture and ask her one small point: that is, whether the Teschen coalfield area of Czechoslovakia which was claimed by Poland still remains within the limits of the Czechoslovak state.

Mrs. J. A. STEERS: I asked whether there were any changes of frontier to record in the Těšín region, and was told that the only frontier definitely fixed was that confirming the surrender of sub-Carpathian Russia to the Soviet Union. There are other areas under consideration on the northern frontier but none are actually demarcated.

The points Professor East raised are certainly of great interest, especially those of the geographical framework for Central Europe and the infiltration of the Germans into Bohemia. Perhaps I may assure Professor East that in the text for the *Journal* there is a fuller discussion of the German literature on the former subject than seemed suitable for this evening.

The German settlement of the borderlands of Bohemia, Moravia and Silesia is one which demands detailed study for accurate results. The variety of Germans who came in, the long range in time of their coming, the divers occupations which they followed, the circumstances in the German homeland which led them to emigrate, are so numerous that it is difficult to generalize

and perhaps it was dangerous on my part to do so. But this, I think, holds good: that they crossed the ranges in the early Middle Ages and settled on both sides of the mountains. Thus they gave the impression that there is as much in common between the people on two sides of a range of mountains as there is between the people of a well-defined hydrographic area. I think they were held up by long-established and competent Czech farming, principally in Polabí, but also in the fertile basin round Plzeň. It was this Czech preoccupation with farming rather than with mining, manufacture or trade which determined originally the pattern of German settlement. But it is an immensely complicated question.

The CHAIRMAN: I am sure I am expressing the views of all present when I ask you to accord a vote of thanks to Mrs. Steers for her most interesting and illuminating lecture.

THE AGRICULTURAL REGIONS OF NEW ZEALAND

KENNETH B. CUMBERLAND

THERE IS A voluminous literature devoted to the systematic analysis and description of New Zealand agriculture,[1] but no attempt has previously been made to differentiate on a regional basis the variety of forms which this agriculture assumes. That is the aim of the present article.

Economic Geography has rendered cultural geography a signal service in publishing the most comprehensive regional view of agricultural geography—continent by continent—yet available.[2] It is unfortunate however that no place was found for New Zealand in these series of articles. In few countries is agriculture of such relatively great significance; fewer depend so completely upon commercial forms of agriculture. Yet despite its small area and its uniformly heavy reliance upon primary production, it is geographically inexact to describe the Dominion as "one huge dairy farm" or even as a "mosaic" of small dairy farms. Most elements of both the natural and the cultural landscape in New Zealand may be sharply differentiated on a regional basis; such is also the case with agricultural forms. Of the physical elements, climate and surface configuration especially provide marked regional contrasts; of the cultural elements those produced by agricultural occupancy of the land are most significant, in extra-urban areas. Together these three elements must always play a large part in effective regional studies in New Zealand. Geomorphic provinces and climatic regions have already been given some attention.[3] This article attempts to bridge a serious gap in New Zealand geographical literature by delimiting and describing the distinctive agricultural regions of the Dominion.

Derwent Whittlesey has provided the most satisfactory classification to date of world agricultural regions.[4] He listed five "functioning forms"[5] that characterize the agriculture practised in any area, and he used these as the

[1] See especially H. Belshaw (edit.), 'Agricultural organisation in New Zealand,' London, 1936; R. O. Buchanan, 'The pastoral industries of New Zealand' (Institute of British Geographers, publ. no. 2), London, 1935; W. M. Hamilton, 'The dairy industry in New Zealand,' London, 1944; Department of Science and Industrial Research, *Bulletins*, various; *New Zealand Journal of Agriculture*, vols. 1–70, 1910–45; and 'Farming in New Zealand' (New Zealand Department of Agriculture, *Bulletin*, no. 252) 1946.

[2] O. Jonasson, O. E. Baker, S. Van Valkenburg, G. B. Cressey, R. B. Hall, Griffith Taylor and H. L. Shantz in *Econ. Geogr.*, vol. 1, 1925, and succeeding volumes.

[3] C. A. Cotton, "Geomorphic provinces in New Zealand," *N.Z. Geographer* (1945) 40–47, and B. J. Garnier, "The climates of New Zealand: according to Thornthwaite's classification," *Ann. Assoc. Amer. Geogr.*, 36 (1946) 151–177.

[4] Derwent Whittlesey, "Major agricultural regions of the earth," *Ann. Assoc. Amer. Geogr.* 26 (1936) 199–240.

[5] These are: (1) crop and livestock association; (2) methods used; (3) intensity of application of labour, capital and organization, and output of products which results; (4) disposal of the products; (5) ensemble of structures used to house and facilitate farming operations.

bases of classification. In what follows Whittlesey's proposals have been applied to a country in which agriculture is of prime importance, and in which it assumes distinctive forms that are sharply differentiated from region to region. They have been used to produce a "refinement" such as Whittlesey himself "envisioned within the framework [he] outlined," and to provide a descriptive and statistical guide to the variety of agricultural activities which characterize New Zealand. Of the thirteen generic agricultural regions which the classification admits, three are to be found in New Zealand—ignoring suburban or other relatively negligible areas of Specialized Horticulture (M). Whittlesey's small-scale world coverage recognized only two types in New Zealand: Commercial Ranching (B) and Commercial Dairy Farming (L). The other major type present is Commercial Livestock and Crop Farming (J).

The ultimate means of delimiting the agricultural regions of New Zealand shown in Fig. 1 was observation in the field. Over a period of eight years the landscape of New Zealand was observed from Waipapakauri to Tuatapere with the prime object of studying soil erosion and with the auxiliary object of noting any significant geographical boundary or transition, including inevitably agricultural boundaries or transitions. Elements in the landscape that reflect Whittlesey's "functioning forms"—land use, ratio of crops to pasture, of sheep to cattle, of dairy cows to total cattle, the intensity and continuity of production, methods employed, machines used, kind and arrangement of buildings, enclosures, fences and so on[1]—provided the basis for the initial delimitation of the regions, with slight subsequent modifications. The thesis tentatively accepted was that the twelve agricultural regions thus delimited each constitute a specific unit different from all others in terms of its agricultural character and "functioning forms." This theory was then tested by detailed study and analysis of all official statistical data available pertaining to the "functioning forms" criteria.[2] These suggested but minor changes of regional boundaries and provided striking confirmation of the thesis earlier adopted on the basis of field observation alone. Statistical data (see Tables 1 and 2) also suggested the grouping of specific regions into types (generic regions), three of which fit admirably into Whittlesey's system of "major (world) agricultural regions."

[1] Whittlesey's fourth "function form"—disposal of products for consumption, whether used for subsistence or sold off—has uniform application in New Zealand. Agriculture is everywhere commercialized and virtually all ultimate products are for cash sale. The only variable in this general connotation is whether the produce is mainly for internal consumption or for export overseas. In general the major part of all dairy, meat and wool products is exported, and the bulk of arable products (other than those fed to animals) are consumed in the Dominion.

[2] In this exercise statistics were resorted to in order to apply a strictly scientific method of attempting to *falsify* a theory based on field work (see K. R. Popper, "The poverty of historicism, II" *Economica*, vol. 11, no. 43, 1944, for a short account of the scientific procedure in question). It would be chimerical to assume that statistical data could have been used to replace field observation in this case. Empirical recognition of regional boundaries or transitions through the study in the field of those observable elements of the landscape which constitute the structure of agriculture regions is essentially a subjective exercise based on personal judgments. The combined procedures adopted here tend to reduce the subjective element to a minimum. A note on the sources of statistical data appears at the end of this paper.

L. *Commercial Dairy Farming*
1. *Northland–Coromandel–Bay of Plenty*
2. *Waikato–Hauraki–Piako*
3. *Taranaki*
4. *Manawatu–Horowhenua*

B. *Livestock Ranching*
5. *Wanganui–Taranaki hinterland*
6. *Eastland*
   a. *Hawkes Bay*
   b. *Poverty Bay*
7. *South Island High Country*
   a. *Central Otago*
   b. *Awatere–Wairau*
   c. *Waimea*
8. *Banks Peninsula*

J. *Commercial Livestock and Crop Farming*
9. *Canterbury Plains and Downland*
10. *Southland–East Otago*

X. *Less Important Farming Regions*
11. *Volcanic Plateau*
12. *Westland*

Shaded areas agriculturally unproductive, not regionally differentiated

Figure 1

General character of New Zealand agriculture

The New Zealand countryside derives much of its character from one of three forms of commercial agriculture: Commercial Ranching (B), Commercial Dairy Farming (L) and Commercial Livestock and Crop Farming (J). In New Zealand parlance these might be referred to respectively as hill sheep rearing (or pastoral farming), dairying, and cropping (or mixed farming). In view of the impressively broken and mountainous character of New Zealand it is not surprising that considerable areas fall into Whittlesey's unlisted fourteenth category and are "totally unused for agriculture," Non-agricultural Land.

New Zealand agriculture is young. Nowhere has it yet been finely adjusted to the requirements of the environment. It is still confronted by many basic problems. It has assumed its present characteristics since the introduction of refrigeration in 1882, and very largely in the last fifty years. Commercial dairy farming regions (L1 and much of L2 for example) are barely a generation old. Other regions are agriculturally still less mature. They are indeed so immature as still to defy effective classification. For this reason a further category is here suggested: Less Important (and Immature) Farming Regions (X). The west coast of the South Island and the volcanic interior of the North Island are best regarded at this stage as frontier agricultural regions such as elsewhere have been the subject of special geographic investigation.[1]

The outstanding importance of pastoral farming and the relatively extensive livestock economies also reflect the youth and immaturity of New Zealand agriculture. Arable forms of agriculture are relatively insignificant. The only outstandingly important crop is grass. Even in the wartime and immediately post-war years of world food crisis, New Zealand was not able to produce enough wheat for its domestic requirements. It may well be claimed that New Zealand's rôle as a producer of surplus primary products is based upon pasture grasses—native and alien—and upon the techniques evolved in the country for establishing, maintaining and improving these pasture plants. It is by the employment of expert and original skills in pasture management and by capitalizing to the full certain physical endowments of the land itself, notably its supply of sunshine and abundant rain, that the New Zealand farmer has—despite his brief occupancy of the country—been able to far outstrip all his rivals in *per capita* production.[2]

New Zealand's 86,137 farms—many of them might be better described as "ranches"—occupy almost 43 million acres. The average holding is one of 499 acres. While the individual farmer produces more than his counterpart in any other country, he requires a larger area upon which to do so. New Zealand's farms carry some 67 million "livestock units" [3] or 1566 per 1000 acres of occupied land. This is not a high figure, especially in view of the restricted area and limited production of grain and other arable cash crops.[4]

[1] See "Pioneer settlement" (American Geographical Society, Spec. Pubn., no. 14), New York, 1932.

[2] See Ellsworth Huntington, "The geography of human productivity," *Ann. Assoc. Amer. Geogr.*, 33 (1943) 1–31.

[3] In terms of sheep, a horse equals 10 units, a cow 7 and a pig 1. Other classes of livestock are ignored in this and similar calculations which follow.

[4] Only 2·9 per cent. of all occupied land is devoted to field crops.

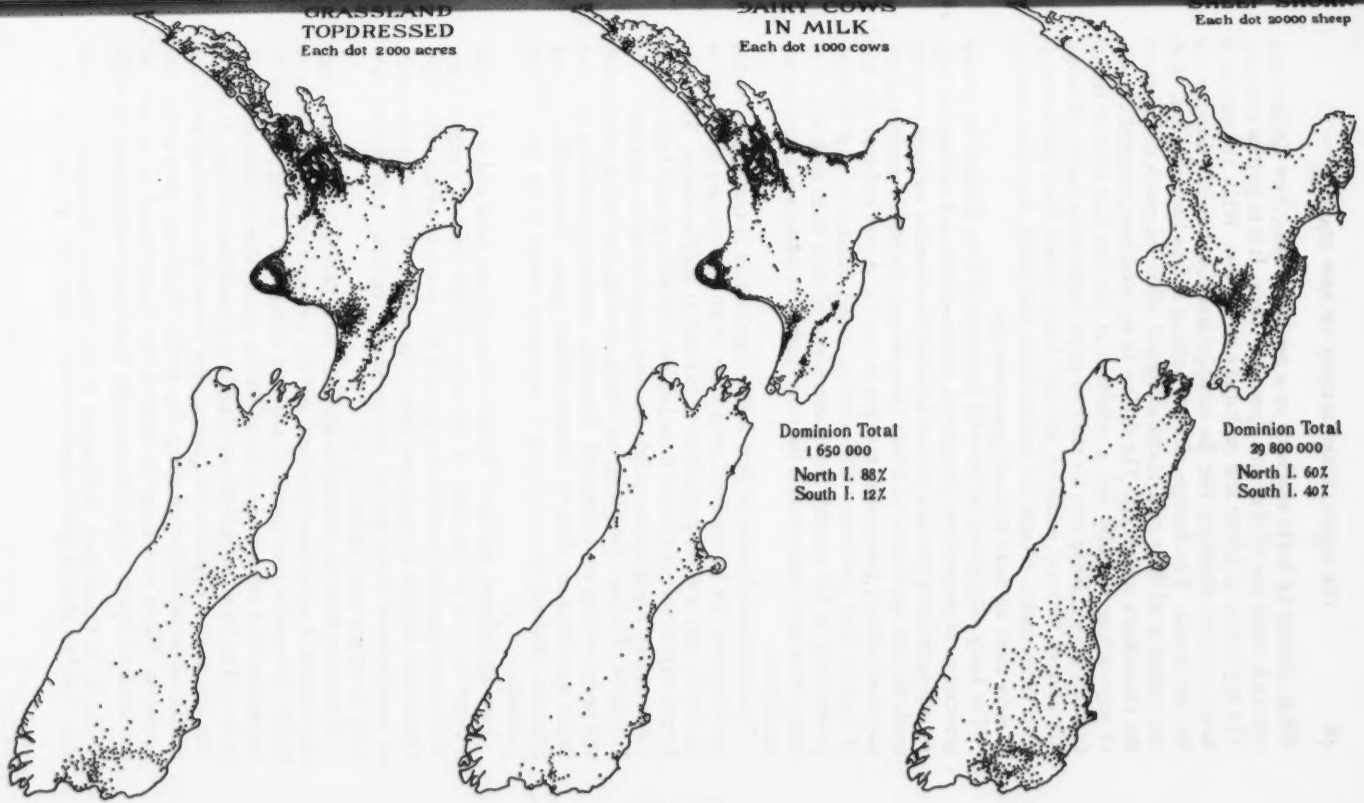
GRASSLAND
TOPDRESSED
Each dot 2000 acres
DAIRY COWS
IN MILK
Each dot 1000 cows
Dominion Total
1 650 000
North I. 88%
South I. 12%
SHEEP SHORN
Each dot 20000 sheep
Dominion Total
29 800 000
North I. 60%
South I. 40%

Figure 2

While efficient by world standards on a *per capita* basis, New Zealand agriculture is much less efficient on a "per acre" basis. It is in general extensive. The application of labour and capital per acre is low. While the number of farms continues steadily to rise, the occupied area shows a slight decrease over the last decade. The average area per holding is thus becoming less. With one exception all these general characteristics reflect the youth and vigour of the Dominion's agriculture. The decline in the total area occupied is a sign of approaching maturity and a reflection of the fact that even if minute frontiers are still being won for stock or crops, larger areas, mainly of eroded hill country formerly occupied, are now being retired from production as their deterioration reveals the foolhardiness with which they were assailed, in some cases no more than one generation ago.

The hasty subjugation of the wild landscape of New Zealand by pioneer generations of pastoralists, ploughmen, timber millers and miners, the large *per capita* output of past and present farmers, the extensive methods so widely used, the low application of labour per acre and the highly commercialized nature of primary production, are each in varying degree reflected in a host of serious land problems.[1] Soil erosion, weed infestation and declining productivity of hill country are characteristic of such wide areas and of so many farms as to rank amongst the more distinctive features of contemporary agriculture.

The commercialization of New Zealand agriculture is apparent in marked specialization. An infinitesimal proportion of its products are consumed on the farm; only a small proportion is retained in the Dominion. The dairy farmer buys factory butter and tinned cheese; the wheat grower buys potatoes for household consumption which are often grown in some other part of the Dominion. Contract ploughing, harvesting, mowing, hay baling, top-dressing and hedge-cutting are widespread. Shearing, crutching, mustering and other major operations are done by itinerant labour gangs. Share-milking is very frequent, although share-cropping is uncommon except in the case of single paddocks.

Four agricultural products—butter, cheese, frozen meat and wool—alone account for over 70 per cent. of the value of New Zealand's export trade. With minor pastoral products they formed 82·2 per cent. of the value of the Dominion's exports in 1944; and before the wartime increase in the export of manufactured items and of certain arable products these figures were fully 10–15 per cent. higher.

It has long been the custom to attribute New Zealand's ability to furnish this surplus of agricultural products, and the country's general prosperity, to highly favourable conditions of soil and climate. It should however be emphasized that much more is due to human agency than to inherent natural factors. The New Zealand climate is fickle and sometimes violent. Abundant sunshine and precipitation are general. But rainfall is erratic and even high rainfall areas are subject to sharp dry spells. Winds are often strong and persistent. Frosts may occur in parts of the South Island on as many as two hundred days in a year. Moreover the Dominion's soils are not inherently

[1] See K. B. Cumberland, 'Soil erosion in New Zealand,' Wellington, 1944, and *idem*, "Land problems in New Zealand: a review", *Geogr. Rev.*, 36 (1946) 137–141.

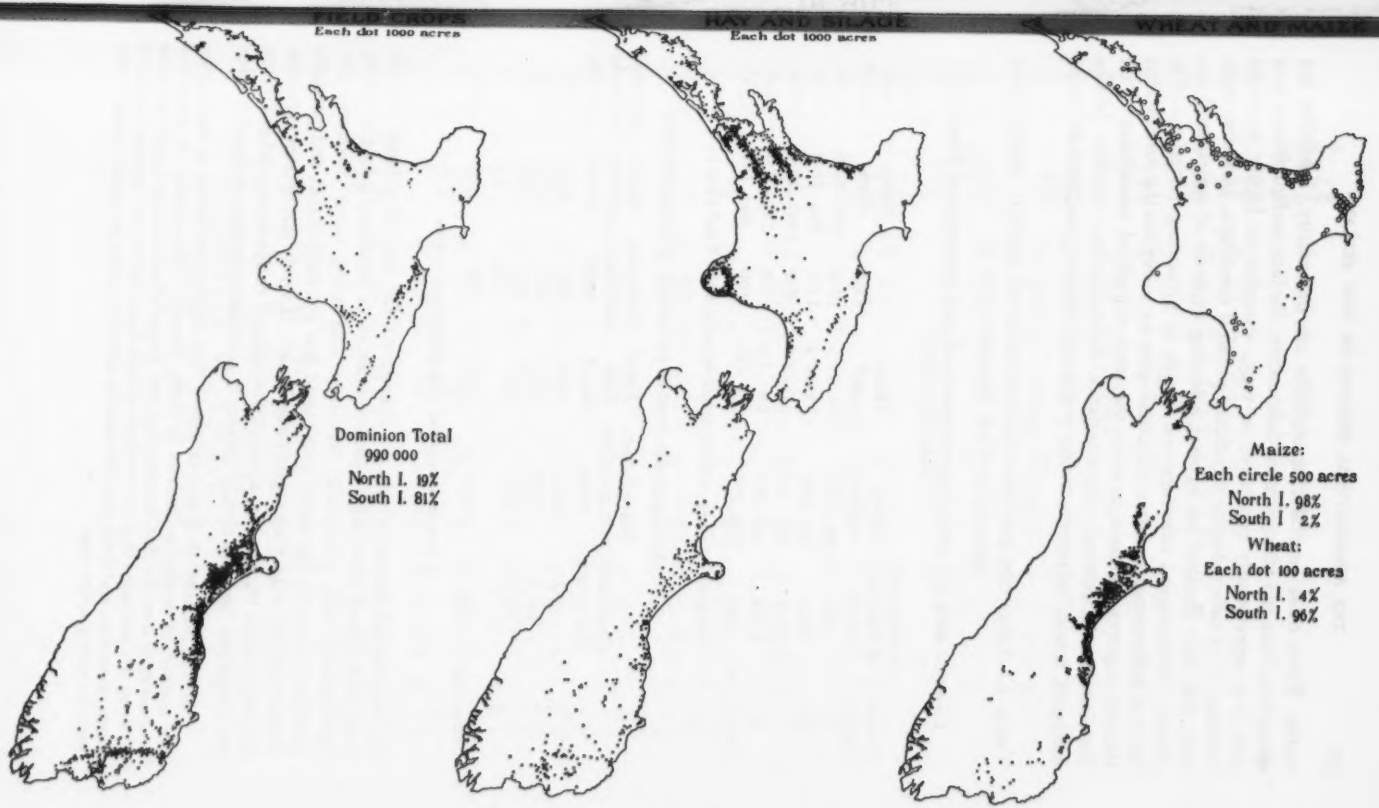
FIELD CROPS
Each dot 1000 acres
Dominion Total
990 000
North I. 19%
South I. 81%
HAY AND SILAGE
Each dot 1000 acres
WHEAT AND MAIZE
Maize:
Each circle 500 acres
North I. 98%
South I 2%
Wheat:
Each dot 100 acres
North I. 4%
South I. 96%

Figure 3

fertile. Their most general characteristics are immaturity, instability and phosphate, lime and trace-element deficiencies. Surface configuration is such that it is infrequently conducive to easy, intensive or highly successful farming. It is rather despite significant physical handicaps, including isolation, that New Zealand has become a leading exporter of agricultural surpluses. Technological efficiency—on farms, in processing factories and in internal and external transport facilities—goes far to explain the paradox, and thereby requires inclusion in even the most superficial assessment of the Dominion's agricultural characteristics. Refrigeration, electric milking machines, header harvesters, tractor power and shearing machines are among

TABLE 1.—LIVESTOCK AND CROP DISTRIBUTIONS FOR GENERAL AGRICULTURAL REGIONS OF NEW ZEALAND (FIG. 1)

Livestock units per 1000 acres occupied land, and percentage of Dominion total (in italics)

Generic region	*Average size of holding (acres)*	*Total cattle*	*Dairy cows*	*Pigs*	*Sheep shorn*	*Livestock units**
L	189	339 *55·7*	201 *77·9*	*77·5*	706 *14·6*	3579
B	2803	55 *34·9*	13 *12·4*	*13·1*	805 *61·7*	1211
J	321	61 *7·3*	25 *8·2*	*8·2*	1295 *22·7*	1822
X	1170	43 *2·1*	10 *1·5*	*1·2*	115 *1·0*	416
Dominion	499	103 *100*	39 *100*	*100*	693 *100*	1566

* In terms of sheep, a horse equals 10 units, a cow 7 and a pig 1

Acreage under crops as percentage of Dominion total

	Grain and seed crops	*Green fodder, root and other crops*	*Total field crops†*	*Total hay and silage crops*	*Grassland top-dressed*	*Orchards and market gardens*
L	*3·4*	*11·3*	*10·0*	*54·0*	*62·8*	*35*
B	*16·5*	*22·0*	*25·4*	*19·6*	*21·0*	*49*
J	*80·1*	*66·7*	*64·6*	*25·3*	*14·9*	*16*
X				*1·1*	*1·3*	
Dominion	*100*	*100*	*100*	*100*	*100*	*100*

† Less area also sown with grasses and clovers

the mechanical factors which are operative.[1] On the other hand scientific plant and animal breeding, intensive systems of rotational pasture grazing, top-dressing with phosphatic fertilizers and many other advanced farm practices suited to the many and varied but generally harsh and persistent demands of the terrain are equally significant. It would not be over emphasizing the point to suggest that appropriate national emblems and other distinctive Dominion insignia should employ a certified ryegrass seedhead, a white

[1] Some 86 per cent. of all cows in milk in New Zealand are milked by machine and the number of machines installed is rising steadily. The number of agricultural tractors more than doubled between 1938 and 1943 and there is now (1947) one tractor to every five holdings; this is a particularly high figure in view of the large number of farms on second- and third-class hill country entirely in grass, no part of which is even used for taking a hay crop.

TABLE 2.—LIVESTOCK AND CROP DISTRIBUTIONS FOR SPECIFIC AGRICULTURAL REGIONS OF NEW ZEALAND (FIG. 1)

Livestock units or acreage under crops per 1000 acres occupied land, and percentage of Dominion total (in italics)

Generic region	*Specific region*	*Average size of holdings (acres)*	*Total cattle*		*Dairy cows*		*Pigs*	*Sheep shorn*		*Live-stock units* •	*Grain and seed crops*		*Green fodder, root and other crops*		*Field crops* †		*Hay and silage crops*		*Grasslands top-dressed*		*Orchards and market gardens*
L.	1. Northland–Coromandel–Bay of Plenty	257	247	*19·9*	115	*24·7*	*29·0*	382	*4·4*	2219	2	*1·3*	3	*1·1*	5	*1·2*	30	*14·7*	195	*15·8*	*10*
	2. Waikato–Hauraki–Piako ..	153	452	*18·9*	268	*30·5*	*31·0*	640	*3·7*	3995	3	*1·1*	17	*4·5*	20	*3·7*	80	*21·3*	559	*27·1*	*20*
	3. Taranaki ..	168	395	*9·4*	232	*14·8*	*9·7*	518	*1·7*	3528	3	—	13	*2·0*	15	*1·8*	82	*11·8*	432	*10·8*	*1*
	4. Manawatu–Horowhenua ..	197	283	*7·5*	108	*7·9*	*7·8*	1365	*4·8*	3542	7	*1·0*	25	*3·7*	31	*3·3*	29	*6·2*	331	*9·1*	*4*
	5. Wanganui–Taranaki hinterland	780	106	*9·7*	19	*4·3*	*4·5*	1039	*13·3*	1920	1	—	5	*2·1*	5	*2·0*	7	*2·8*	61	*5·2*	*5*
	6. Eastland.. ..	839	127	*21·5*	16	*6·3*	*5·9*	1170	*28·5*	2136	2	*3·2*	6	*6·1*	7	*6·0*	5	*6·9*	57	*12·6*	*3*
	a. Hawkes Bay ..	101									19		88		97		61		561		*12*
	b. Poverty Bay ..	192									18		33		47		60		419		*1*
B.	7. South Island High Country ..	3866	8	*3·1*	1	*1·1*	*2·4*	292	*19·1*	359	3	*13·3*	*3*	*13·8*	5	*17·4*	2	*9·5*	5	*3·1*	—
	a. Central Otago	364									49		81		117		46		112		*8*
	b. Awatere–Wairau	210									101		35		118		42		85		2
	c. Waimea ..	93									39		45		78		38		102		*16*
	8. Banks Peninsula	253	118	*0·6*	26	*0·7*	*0·3*	1078	*0·8*	2002	1	—	1	—	2	—	6	*0·4*	14	*0·1*	*2*
J.	9. Canterbury Plains and Downland	331	50	*2·4*	24	*3·3*	*6·1*	1233	*10·1*	1732	174	*66·7*	108	*33·5*	208	*45·2*	49	*15·2*	81	*4·9*	*13*
	10. Southland – East Otago.. ..	307	76	*4·9*	28	*4·9*	*2·1*	1318	*12·6*	1955	13	*13·4*	82	*33·4*	80	*19·4*	28	*10·1*	154	*10·0*	3
X.	11. Volcanic Plateau	1895	29	*0·8*	5	*0·3*	*0·1*	158	*0·7*	388	—	—	2	—	2	—	2	*0·2*	17	*0·2*	—
	12. Westland ..	760	57	*1·3*	18	*1·2*	*1·1*	81	*0·3*	503	1	—	1	—	1	—	4	*0·9*	16	*1·1*	—
	Dominion	499	103	*100*	39	*100*	*100*	693	*100*	1566	13	*100*	17	*100*	29	*100*	16	*100*	94	*100*	*100*

• In terms of sheep, a horse equals 10 units, a cow 7, and a pig 1.
† Less area also sown with grasses and clovers

clover leaf, a Jersey cow, a Romney ewe and a sack of superphosphate, and should discard the long popular and prevalent kiwi and fernleaf.

In the regional description of New Zealand agriculture that follows four *generic* agricultural units are recognized, and within them, twelve *specific* agricultural regions.[1] In two cases only was it thought necessary to designate smaller sub-regions within the specific regions (6a, b and 7a, b, c). The four generic regions are given the comparative names used by Whittlesey, with one addition. While these names do not necessarily correspond with those used in New Zealand by the man on the land or by official agricultural agencies, they still have application and do briefly and adequately describe the major agricultural activities present. These generic agricultural regions are such that they may be fitted into a comparative system of world division. The twelve specific regions within the others are named according to the location of each; and each is considered as being unique in itself. Non-agricultural land cannot, of course, be differentiated on the basis of agricultural criteria. It is here (Fig. 1) grouped together where it is found continuously, as in the axial mountain districts of both islands, and shaded distinctively when occurring discontinuously within agricultural regions.

Commercial dairy farming

Fig. 1 shows that the four regions of intensive commercial dairy farming (L1, 2, 3 and 4) occur in the North Island and occupy about one-tenth of the total area of the Dominion, or 17 per cent. of the occupied land. They embrace virtually all the northern peninsula of the North Island and most of the two littorals of its broader central portion that extend south-westwards and south-eastwards until they abut on the western flanks of the extremities of the mountain axis about Paekakariki and beyond Opotiki. They comprise throughout areas of humid to super-humid mesothermal climate with rainfall normally adequate at all seasons (Thornthwaite, BB'r). Within these areas dairying is found on coastal plains, valley flats or low hill country, and only rarely at over 700 feet above sea-level.

Table 1 reveals some of the principal agricultural characteristics of the generic unit and demonstrates clearly the distinctiveness of its constituent parts in terms of the first and most important of Whittlesey's "functioning forms," the crop–livestock association. It shows that on about one-tenth of the Dominion's area, not all of which is occupied, are to be found more than half of the cattle in New Zealand, over two-thirds of the dairy cows and pigs, but less than a sixth of the sheep. Yet there are more sheep per 1000 acres of occupied land than the average for the Dominion and more than two sheep to each cow. Livestock units per 1000 occupied acres are considerably more than twice the Dominion average (equivalent to over $3\frac{1}{2}$ sheep per acre). The ratio of crops to stock is very low (Table 3); there are less than 5 acres in field crops to each 1000 livestock units. The grain and seed crops

[1] An attempt is made here to differentiate the generic regions only. There is space to give the specific regions no more than passing attention. In Table 2 however these are differentiated statistically. It is hoped that a detailed description of the individual agricultural regions may be published in the near future in the *New Zealand Geographer*, or as a special publication of the New Zealand Geographical Society.

grown in the regions are negligible and only a tenth of the country's green fodder crops are grown there. On the other hand more than half the hay and ensilage produced in New Zealand comes from the intensive dairy farming regions.

Together these bare statistics reflect the activities of thousands of farmers, share-milkers and farm workers on 38,000 farms,[1] over two-fifths of the Dominion total, averaging well under 200 acres each. For New Zealand these are small farms. They are grassland farms, and cropping, other than in the process of establishing or renewing pastures, is unusual. They are closely subdivided into a number of enclosures, each of about 10 acres. In these the dairy herds and other stock graze heavily in rotation. In the early summer season of flush growth some fields are closed up and from them auxiliary winter feed crops of hay or ensilage are taken. The humid to superhumid climatic conditions, the infrequency of ground frosts (from 0 to 35 per year), and the heavy top-dressing of grassland swards (the region embraces almost two-thirds of the farmland top-dressed) together ensure abundant and almost continuous growth, and obviate the need for indoor housing of even the less robust dairy stock.

In common with commercial dairy farming regions elsewhere, the four regions each have the following characteristics: high livestock population densities; a high percentage of cows in milk among total livestock (Table 3); a high ratio of hay and ensilage to grain; a high density of farm population; advanced methods, and a high degree of capitalization and mechanization. In contrast to many commercial dairying regions overseas the percentage of land in crops is low; the degree of dependence on grass is almost unique; and the absence of indoor housing for both stock and stock feed is almost complete. The specialization on butter, cheese and dried or condensed milk is unusual and is due to the distance of the market, the domestic fluid milk market being very small. The breed composition of herds is unique and so also is the closely related high percentage of butterfat in milk; some 75 per cent. of all cows in milk are grade Jerseys. The large rôle played in New Zealand by processing plant, shipping facilities and rapid internal transport is a consequence jointly of many of these distinctive features of the New Zealand dairy lands and of the distance of the market for their produce.

Each specific dairying region has its individual characteristics. These derive largely from fundamental contrasts in terrain, but also from detailed differences in livestock economy (Table 2). While the Northland–Bay of Plenty region is in many ways still one of pioneering agricultural development despite its early European history of destructive exploitation of timber, gold and kauri gum, Taranaki is agriculturally mature (Plates 1 and 2). The circle of land around the base of Mount Egmont is agriculturally "built up." Here the stable production of dairy products, mainly cheese, in many small and evenly scattered factories is the result of an early start and of over half a century of experience. The numbers of cows in milk are steady or locally

[1] Not all these are purely dairy farms. A survey covering 19,307 of these dairy farms conducted by the Government Statistician in the 1935–36 dairying season showed that the average holding totalled 169 acres, 29 of them unused and 49 used for purposes other than dairying.

declining. Northland however has great expanses of gumland and ironstone soils under scrub and fern and danthonia. Dairying is confined to islands of heavily top-dressed pastures of warm-climate grasses, especially paspalum, within these unused or under-used wastes, or is strung out in tenuous lines along infrequent roads linking one island of intensive production with another. The dairy cow population of the Northland–Bay of Plenty region has shown an increase of from 100 to 200 per cent. in the last twenty years. Yet dairy farms here are larger than elsewhere and yields of butterfat per cow and per acre are considerably less. Northland is largely still a land of agricultural promise.

TABLE 3.—SIGNIFICANT CROP AND LIVESTOCK RATIOS

Region		*Livestock units per 1000 acres*	*Percentage* of livestock units represented by*			*Acres in field crops per 1000 livestock units*
			Cows in milk	*Other cattle*	*Sheep shorn*	
L	1	2219	37	42	17	2·4
	2	3995	47	32	16	4·9
	3	3528	47	33	15	4·2
	4	3542	22	35	39	8·7
B	5	1920	6	32	56	2·2
	6	2136	5	37	55	2·9†
	7	359	—	14	81	1·3‡
	8	2002	9	32	54	0·8
J	9	1732	8	10	71	120·5
	10	1955	11	17	67	37·9
X	11	388	9	43	42	4·3
	12	503	25	54	16	2·3

* Difference between sum of these percentages and 100 is represented by horses and pigs.

† Excluding sub-regions 6a, b; otherwise 4·4 acres.

‡ Excluding sub-regions 7a, b, c; otherwise 22·2 acres.

The Waikato–Hauraki–Piako region is the heartland of the New Zealand dairy industry. It takes pride of place because of the outstanding significance of its farming in the Dominion's economy, because of the bulk and value of its products, because of its giant dairy factories, its compactness and cohesion and the effective organization of its commercial activities, and because of the number and density (by New Zealand standards) of its prosperous farm population and rural townships processing the produce of the land. For the most part this region consists of low, rolling, pumice-mantled hills and almost flat, formerly swamp-filled and peat-accumulating basins. It owes its agricultural development and prosperity to the methods evolved for fertilizing the former and reclaiming the latter. The livestock-carrying capacity of its paspalum, ryegrass and white clover pastures to-day exceeds that of pastures in any other agricultural region in New Zealand. More than any other part of the Dominion, this grass-green core of the nation's dairying industry relies upon the availability of phosphates from Nauru and Ocean Island.

1 and 2. Intensive commercial dairy farming landscapes: above, in North Auckland; below, in Taranaki

Phot. N.Z. Department of Internal Affairs

3 and 4. Commercial livestock ranching: above, in inland Wanganui; below, in South Island high country

While of the four dairying regions Taranaki has the most highly specialized dairying economy, the Manawatu–Horowhenua region departs considerably from the "norm" of dairying regions (Table 3). The percentage of its livestock units represented by cows in milk is less than half that of other regions, while sheep, and especially fat lambs, are more than twice as significant in its livestock economy. The larger rôle of sheep in the agriculture of this region is reflected in the larger average size of farms, the smaller proportion of land devoted to hay and silage cropping, and the less intensive use of artificial fertilizers (compare especially regions L2 and L3).[1]

Livestock ranching

Some 29,750 holdings averaging but little less than 3000 acres each, and ranging up to individual sheep runs of over 50,000 acres, occur within the four specific agricultural regions B5, 6, 7, 8. In area, these livestock farming regions are of prime significance; they account for two-thirds of all the occupied land. The landscapes to which they give rise are much more expansive than those of the more concentrated dairy farming regions. The poor land which the farms occupy, however, and the extensive operations, the low application of labour and the limited output per acre reduce the total economic significance of these regions.

In terms of the value of output of primary products they rank next after the commercial dairying regions. Yet it is essential to notice that in the agricultural economy of the Dominion as a whole they have a part which is sometimes overlooked but which is nevertheless of fundamental importance. They are gigantic reservoirs from which virtually all other regions regularly draw livestock to replenish flocks and herds. Conditions in these high-country regions usually prohibit the fattening and finishing of stock for freezing works or family butchers. They produce wool and a surplus of store stock. The second is a valuable item of farm income. It is also the source from which the down-country grazier—whether mixed farmer, dairyman or sheep fattener—draws to renew his ewe flock, to provide wethers for topping-off or to furnish store cattle for finishing. The annual migration of stock from hill to valley, from mountain to plain, from Coromandel and Poverty Bay to the Hauraki Plains and Waikato Basin, and from inland Otago and the Mackenzie country to the Canterbury Plains is a regular and characteristic feature of New Zealand agriculture. In these times when the remoter back country is so often deteriorating and is being disfigured by soil erosion and abandoned to weeds and second growth, and when there is so much ill-informed talk of closing it up, the peculiar rôle it plays in the economy of the country and its pivotal situation in the various agricultural systems should not be overlooked.

Two regions falling into the generic group of extensive livestock rearing are found in the North Island, two in the South Island. For the most part they comprise steep and broken hill country of considerable elevation. Immediately east of the alpine divide in the South Island the largest of these units embraces deeply dissected, high country ranging from 1000 feet to over

[1] For studies of individual farms and their economies in these and the other specified regions, see the bibliographical note at the end of the paper.

8000 feet (Plate 4). Hardy sheep graze over the lower half of this range of elevation during the summer months, although winter snow restricts their grazing to valley floors and lower *adret* slopes for half the year. Besides the once heavily forested, Tertiary hill country of inland Taranaki and Wanganui (Plate 3) with its predominantly super-humid microthermal climate (AC'r), extensive stock rearing occurs east of the divide and extends continuously (except for Cook Strait) from East Cape to Lake Te Anau in the far south through areas of generally less humid character. The eastern parts of the North Island have BB'r climates but are frequently subject to sharp summer dry periods which hasten and reinforce the late summer outflow of surplus store stock. Banks Peninsula may be considered an "outlier" of this region climatically, agriculturally and in many other respects. The eastern and interior grazing lands of the South Island—indigenous tussock grasslands—are generally cooler, drier and subject to hard frosts most of the year and to winter snow. They have BC'r and CC'r, even CC'd and DC'd, climates.

The regions of extensive livestock rearing embrace two-thirds of the total occupied land in the country—four times that found within the commercial dairying regions. They account however for only one-third of the Dominion's cattle. Sheep are all-important; over two-thirds of New Zealand's sheep population is found here and they represent from 55 to 85 per cent. of all livestock units. Even so the carrying capacity of these hill pastures is limited. Almost as many sheep are carried per thousand acres of occupied land in the dairying regions and half as many again in the mixed farming lands. Total carrying capacity in terms of livestock units is only one-third that of the dairy farm lands. It is significant that there are four times as many beef cattle and other non-dairy breeds as there are dairy cattle.

Discontinuous pockets, areally restricted valley flats and alluvial plains within the extensive hill sheep-rearing regions, together account for one-fifth to one-quarter of the cropped land in the Dominion and, incidentally, for half New Zealand's orchards and market gardens. Haymaking and top-dressing of grassland occur to a similarly restricted extent.[1] It is obvious that the twenty million sheep here and the whole extensive pastoral economy rest upon the use of hill and mountain pastures, half of them established by man after the clearing of forest and scrub, half of them the modified mountain remnants of the South Island's indigenous tussock grasslands.

Like livestock ranching regions elsewhere in the world those in New Zealand occupy the harsher, hillier environments; land is extensively used; holdings are large and population thinly scattered; the ratio of stock to occupied land is low; the ratio of cropland (almost exclusively hay) to occupied area is much lower still, and the return is low per acre but high per animal and per unit of labour. Absentee ownership is frequent. But in contrast to most livestock ranching regions, those of New Zealand are not

[1] These pockets of more intensive farming within the extensive pastoral regions are indicated on Fig. 1. They account for virtually all the arable cultivation, fruit growing, market gardening and for the bulk of the haymaking allocated to generic region B. If these sub-regions are excluded the overwhelming dependence of farming on hill pastures is even more apparent. There are then less than two acres in field crops to each 1000 livestock units.

(with the possible exception of part of B7) "dry land" regions; they occupy formerly forested, humid or superhumid tracts as well as less humid, natural grasslands; and in three of the four regions holdings are *relatively* small and carrying capacity *relatively* high (Table 2). In general, regions B5, 6 and 8 are a kind of "insular" variant of the true type, while region B7 is in many ways more "continental" and more true to type.

The specific regions of the North Island and Banks Peninsula (B5, 6, 8) are somewhat similar in milieu and farm economy; all stand in marked contrast to the South Island high country (B7). The Taranaki–Wanganui hinterland (Plate 3) is a region of serried, steep-sided, ridge-topped hills cut out of Tertiary sediments by a ramifying dendritic net of streams. It is a drab, dull landscape of grey-green scrub, poor pasture and dark relic stands of native bush, providing little evidence of occupation. The large pastoral farms are scattered and isolated in this array of steep hills. Skilled management and carefully controlled stocking practices are necessary in face of the ubiquitous forest potential of the reverting man-made swards. On these large farms sheep represent well over half the declining number of livestock units, and station cattle, carried primarily for treading second growth, represent another third.

Eastland is more extensive and less compact, and embraces brighter pockets within its 6·79 million acres. The drier coastal hills, once in scrub and fern and now in crisp (induced-indigenous) danthonia pastures, form ideal, healthy sheep country—the North Island's greatest single reservoir of store stock. The inner hill country, more elevated, damper and generally in browntop, has the reversion tendencies and soil erosion problems of the inland Taranaki–Wanganui region (B5). Quite different and distinctive however are the Heretaunga Plains and Poverty Bay flats (sub-regions B6a, b). Here intensive forms of agriculture alone occur. Fodder crops (cattle pumpkins, maize, roots and clovers) are grown. Hawkes Bay ryegrass seed has an international reputation. The two sub-regions also account for over a tenth of the Dominion's orchards, market gardens and vineyards.

Banks Peninsula is the smallest of the specific agricultural regions. In essence only is it akin to the other South Island commercial livestock rearing region; in detail it finds closer parallel in Eastland. It is indeed agriculturally, as in many other respects, a once-forested "outlier" of the North Island tied to the South.

The South Island high country (Plate 4) is the most distinctive of the livestock rearing regions. Its extensive pastoralism is New Zealand's nearest approach to the commercial ranching of North America or of the Australian "out-back". Unlike its counterparts in New Zealand or overseas, it comprises elevated and rugged alpine mountain range; and its pastoralism is built on the extensive grazing of native tussock grasslands, not on pastures of alien grasses won from the bush. Its 17 million acres support a sparse stock population of no more than 300 livestock units per thousand acres of mountain grazing, herbfield and scree waste. Merino or merino-cross sheep represent 81 per cent. of livestock units; elsewhere Romney strains dominate. No other livestock ratio shown in Table 3 is nearly so large. Specialization is thus almost complete. Fine wool and a few store stock alone come from the huge runs.

Sheep share the deteriorating mountain range from Marlborough to Southland with a few run cattle, thousands of deer and millions of rabbits.

Within or about the northern extremity of the high country are three sub-regions of easier relief and more intensive economies (Fig. 1 and Table 2). In the gravel-floored structural troughs of central Otago (B7a) the availability of irrigation is the factor of greatest significance (Plate 7). In Nelson (B7c) and Marlborough (B7b), coastal situation, surface configuration and tillable soils are more important. All three sub-regions are agriculturally distinctive. They have in common however intensive farm practices, holdings smaller than the Dominion's average, specialized crops (especially in Nelson), high livestock carrying capacities, drier climates (CB'r, CC'd, DC'd) and more than 2200 hours of bright sunshine. Together they account for more than a quarter of the Dominion's orchards and market gardens, in addition to which the Waimea valley and adjacent areas in Nelson virtually monopolize such unusual crops as hop vines and tobacco. The alluvial soils of Waimea county, a little over 8000 acres, produce annually nearly one million pounds' worth of apples, tobacco, tomatoes, hops, raspberries and peas.

Commercial livestock and crop farming

Two specific agricultural regions in which the economy is essentially mixed (J9, 10) and in which it embraces both crop production and stock rearing constitute the South Island's most impressive and important agricultural feature, in much the same way as specialized forms of dairy farming form the most distinctive feature in the North Island's agricultural character. The gravel, loess-strewn plains of the eastern littoral of the South Island, and the rounded "downland" forms of low Tertiary hills interposed between the plains and pastoral high country, both lend themselves to tillage operations and machine harvesting. Climate too is not generally adverse to the successful growing and ripening of grain, green fodder, pulse, root and seed crops. It is characterized by relatively low rainfall totals, higher mid-summer temperatures and over 2000 hours of bright sunshine each year. Climates are principally CC'r, CC'd and CB'r.

On less than a tenth of the total area of the Dominion, a little over a tenth of the occupied land, are here concentrated two-thirds of the country's total field crops, including four-fifths of the grain and seed crops, and over a quarter of the land devoted to hay. Amongst field crops produced by the 16,000 holdings involved (other than oats, wheat and barley) are turnips, swedes, alfalfa, chou moellier, lupins and rape, all destined for stock feed, as well as cash crops such as peas, potatoes, flax and linseed for human uses and grass seed for export.

Relatively few cattle are found here, although the numbers of dairy cows are not significantly inferior to those in the very much more extensive livestock rearing regions. Sheep occur on almost every farm and the generic region accounts for approximately one-quarter of the Dominion's total. The density of sheep is higher than elsewhere; half as many again are found to every 1000 acres occupied as compared with the hill sheep-rearing regions (B). Carrying capacity, as reflected in the aggregate number of livestock units per 1000 occupied acres, is above the Dominion's average. The ratio of dairy

Phot. N.Z. Farmer Weekly

5 and 6. Mixed crop and livestock farming: above, in east Otago and south Canterbury downland; below, near Winton in the Southland plain

Phot. N.Z. Farmer Weekly

7. Irrigated Mauhnerikia valley in the man-made desert of central Otago, contrasting with denuded hill-country beyond

Phot. N.Z. Farmer Weekly

8. Dairying in Westland

cows to total cattle is intermediate between those of intensive dairying (L) and extensive livestock regions (B).

Despite the very high crop area in relation to livestock carried (from 30 to 120 acres per 1000 livestock units), the fact must not be overlooked that the principal "crop" is grass. This is true alike of the Southland Plain, the Otago and South Canterbury "downland," the Canterbury Plains and the Awatere, Wairau and Waimea valleys. The area of temporary and short-rotation pastures, together with the small patches of long-rotation or permanent grassland, occupy an area considerably greater than all field crops. Wheat, oats, turnips, rape, swedes, kale, barley, peas and potatoes (in that order) are the principal crops grown; the first occupies less than a quarter of a million acres and the last not more than 25,000 acres. In aggregate, the Dominion's field crops total about 1,250,000 acres—less than 3 per cent. of the occupied land. However, almost one million acres of these are located within the mixed farming regions, as here defined, and these account for 20 per cent. of the occupied land in holdings.

While they reveal greater diversity in detail than the dairying and sheep rearing regions, these regions of mixed farming, like their counterparts overseas, show essential uniformity in outline. The percentage of cropland, including hay, to total occupied area is high (up to 30); the ratios of livestock to both crops and total area are also considerable; crop yields are high; subsidies and other political devices largely determine the detail of crops produced within the general requirements of rotations; the bulk of livestock are meat-producers; and scientific rotations, careful plant and animal selection and a high degree of mechanization are characteristic. Only in a few, less fundamental traits do the New Zealand regions depart in type from their counterparts abroad; notably in that sheep, not pigs or cattle, are the livestock reared (they account for as much as 70 per cent. of all livestock units), and in that markets, other than for certain cash crops, are distant overseas.

The mixed farming economy of the Canterbury Plains and "downland" (Plate 5) is currently subject to considerable change and improvement. It was established in the 1890's after the passing, first of extensive pastoralism like that which still persists in the high country, and next of commercial grain farming (Whittlesey's Type I). The contemporary mixed practices are becoming increasingly efficient and conservational. Facilities have recently been made available for irrigating 200,000 acres of Ashburton County from the snow-fed waters of the Rangitata, and it is technically possible in the future to irrigate several times this acreage. This may well give grass and alfalfa a further competitive advantage over depletive cash crops, many of which are heavily subsidized. And as it is demonstrated that enduring stands of alfalfa and subterranean clover can be maintained on even the lightest gravelly soils of the plains, the dryland farming practices of the recent past, entailing the frequent renewal of pastures and the taking of intermediate cash crops, seem destined to give way to more intensive systems of predominantly grassland farming. In this case, livestock carrying capacity must rise. It is not likely, however, that the *relative* importance of the region as a producer of arable crops will decline. It will probably continue to produce two-thirds of the Dominion's grain crops, over four-fifths of the wheat and more than a third

of all green fodder crops; but the acreage of crops per 1000 livestock units may decline appreciably from the present figure (120), which is more than three times greater than the corresponding figure for Southland and East Otago (J10).

This last region (Plate 6) does not have the simple two-fold pattern of physical milieux of the Canterbury region (J9). It has not only gravel plains and loess-coated "downland," but in addition a variety of other settings including extensive red tussock and manuka swamp, forested hill country and bleak interior upland. Moreover rainfall is almost everywhere heavier, and summer temperatures lower. But in these varied environments mixed farming is everywhere characteristic. In detail only does land utilization vary from one part to another and from the more uniform agricultural patterns of Canterbury. Locally dairying and the cropping of hay, clover and oats go together; elsewhere fat lambs and green fodder crops; in other localities store sheep or beef cattle with swedes and other root crops provide the characteristic notes.

In its general features, however, region J10 differs from J9. Only 40 (as against 120) acres per 1000 livestock units are in field crops. This reflects three other differences: Southland's better pastures; the emphasis there on fodder (turnips, swedes, oats, mangels, chou moellier and so on) rather than cash grain and seed crops; and the heavier use of lime and phosphatic fertilizers. Cows in milk and "other cattle" both account for larger proportions of the total livestock units than is the case in region J9.

Less important farming regions

The essential agricultural characteristics of the two less important agricultural regions (X11, 12) are not yet clearly established. They are both isolated and relatively inaccessible, one in the North Island's bleak exposed interior, the other on the discontinuous narrow tracts of shingly river flats in forest, sea and mountain-bounded Westland. While the latter has long been settled and indeed once contained the majority of the country's population, the former has only recently been developed. Agriculture in Westland has always been, and still remains, economically insignificant beside gold mining, coal mining and timber milling. On the volcanic plateau of the North Island, however, agricultural development has very recently been so rapid as already to threaten to exceed in importance all other forms of economic activity; and this despite the attractions to tourists of the thermal areas it contains, and the recently enhanced value of its rapidly maturing stands of exotic conifers.

Table 1 indicates that agricultural activities in these two regions are founded on grass and livestock. An infinitesimal part of the Dominion's field crops is produced in them, and only 1 per cent. of the country's hay. Yet they accommodate 2 per cent. of the Dominion's livestock, with emphasis on cattle (particularly non-dairy cattle), although there are rather more than two sheep to each cow, as in the intensive dairying regions. Carrying capacity is low; livestock units to each thousand occupied acres are only a third of those in the extensive livestock rearing regions and little more than one-tenth of those in the dairy lands. This is a reflection of the fact that very large parts

of the occupied land are not used for agriculture; they are still in bush, scrub or swamp. A large proportion of the area within the two regions also comprises non-occupied and non-agricultural land. This is true of Westland as well as of the interior of the North Island, but the broken character of the "plain" and the discontinuity of farmland prevents the delimitation of non-agricultural land on Fig. 1.

The elevated central plateau of the North Island has a deep but varied mantle of volcanic ash, and the development of farms on its cool, exposed surface has been retarded by the general poverty of its immature pumice soils, its inaccessibility and the occurrence there of a deficiency disease of stock known as "bush sickness." In consequence large areas have been given over to planted forests of exotic softwood timber trees. But with the discovery that bush sickness can be overcome by remedying the cobalt deficiencies of soils, and with the development of pumice reclamation practices and the lavish use of phosphates, valuable pastures have been established. With the "winterless North," the volcanic plateau offers the greatest scope and most promising possibilities of extending farm settlement. As yet the region accommodates less than 1 per cent. of the Dominion's livestock, but dairy farms are creeping on to the more accessible margins of the region, especially those adjacent to the established dairy lands. Elsewhere the usual dairy pastures of ryegrass and white clover are not at their best with the cooler summers and frosty winters of the elevated interior. Here use is made of cocksfoot and red clover which are better suited to more extensive grazing by Hereford beef cattle. Over by far the greater part of the region, however, stunted manuka scrub and tussock still extend for miles and support no agricultural enterprise.

Westland is perhaps the most distinctive geographic unit in New Zealand. Its individuality owes more, however, to its rain-drenched, mountain-hemmed and bush-clad setting and to its hectic and fluctuating history than to its agriculture. Eighty years ago it was a mushrooming El Dorado with the bulk of the infant colony's population. To-day it has the more prosaic rôle of coal and timber producing. Agriculture is still limited. Farms occur in "island" groups and are really extensive if incomplete clearings in the forest. Even on gravelly river flats, leaching, podsolization and pan-formation make pasture establishment difficult. Many clearings have early reverted to blackberry, gorse and native second growth. Cattle alone are important. Only in three dairying regions does the proportion of sheep fall so low. Nowhere else do "other cattle" (largely beef cattle) form such a high proportion of total livestock units. Dairying occurs where the clearings are sufficiently extensive to support a small dairy factory (Plate 8). Elsewhere, and especially in remote south Westland, beef cattle are reared.

Bibliographical note

A large number of studies of individual farms have been made in New Zealand, nearly all of them contributed as articles in recent issues of the *New Zealand Journal of Agriculture*, which can be taken as samples of the regional types of agriculture. A selection of them is given here, on the basis of the regions shown in Fig. 1.

Region L1: E. H. Arnold, "A northern Wairoa farm," *N.Z. J. Agric.*, 70 (1945) 9–21; *idem*, "A Northland hill country farm," *ibid.*, 72 (1946) 237–250; P. S. Syme, "A Woodhill dairy farm," *ibid.*, 68 (1944) 409–413; *idem*, "A Rodney gumland farm," *ibid.*, 68 (1944) 249–254; and A. V. Allo, "A Tauranga dairy farm," *ibid.*, 72 (1946) 569–578.

Region L2: A. V. Allo, "A Hauraki plains farm," *N.Z. J. Agric.*, 69 (1944) 297–302; W. V. Hadfield, "A Pukekohe small holding," *ibid.*, 71 (1945) 477–488; A. D. Mercer, "A Manakau mixed farm," *ibid.*, 73 (1946) 203–210; K. M. Montgomery, "An Otorohanga dairy farm," *ibid.*, 74 (1947) 171–178; I. L. Nottage and A. V. Allo, "A mixed fruit and dairy farm in the Tauranga district," *ibid.*, 71 (1945) 563–570; P. S. Syme, "Town milk supply" [Auckland], *ibid.*, 71 (1945) 155–159; A. T. Shannon, "A Waipa fat lamb farm," *ibid.*, 70 (1945) 493–503; *idem*, "A Waipa dairy farm," *ibid.*, 70 (1945) 573–580.

Regions L3 and L4: A. C. Burgess, "Sharemilking in north Taranaki," *N.Z. J. Agric.*, 71 (1945) 621–628; J. E. Davies, "A south Taranaki dairy farm," *ibid.*, 70 (1945) 345–354; H. de O. Chamberlain, "A Halcombe mixed farm," *ibid.*, 72 (1946) 27–32.

Region B5: A. R. Dingwall, "A Taihape sheep farm," *N.Z. J. Agric.*, 73 (1946) 399–403. See also K. B. Cumberland, 'Soil erosion in New Zealand,' pp. 31–44, and "Deterioration of Crown Lands in mid-west districts of the North Island," *N.Z. J. Agric.*, 31 (1925).

Region B6: H. Guthrie Smith, 'Tutira,' 2nd ed. 1926; H. M. Hodgson, 'Kiwi station, Wairoa, Hawkes Bay' (Univ. N.Z. thesis, 1941); V. P. Boot, "A Poverty Bay hill-country farm," *N.Z. J. Agric.*, 73 (1946) 519–528; N. Lamont, "A Wairarapa pastoral farm," *ibid.*, 70 (1945) 121–130; E. M. Bates, "A Hawkes Bay mixed farm," *ibid.*, 69 (1944) 521–527; R. P. Hill, "A Heretaunga plains farm," *ibid.*, 71 (1945) 349–352; *idem*, "A Hawkes Bay coastal sheep station," *ibid.*, 73 (1946).

Region B7: A. G. Calder, "An Otago pastoral farm," *N.Z. J. Agric.*, 69 (1944) 409–416; *idem*, "Irrigation [on two farms] in central Otago," *ibid.*, 72 (1946) 363–370; K. B. Cumberland, "High country 'run': the geography of extensive pastoralism in New Zealand," *Econ. Geogr.*, 20 (1944) 204–220; *idem*, "Burning tussock grassland: a geographic survey," *N.Z. Geogr.* 1 (1945) 149–164; J. D. Pascoe, "Canterbury high country: the sheep and sheepmen of the mountains," *N.Z. Geogr.* 1 (1945) 19–39; L. G. D. Acland, 'Early Canterbury runs," 2 vols., 1930 and 1941; D. R. Wilkie, "A Marlborough mixed farm," *N.Z. J. Agric.*, 73 (1946) 319–326; and J. W. Woodcock, "Farming in New Zealand: Otago," *ibid.*, 74 (1947) 21–35.

Regions J9 and J10: G. K. McPherson, "A Canterbury mixed farm," *N.Z. J. Agric.*, 70 (1945) 233–240; J. D. Wraight, "A Waimate farm," *ibid.*, 69 (1944) 105–108; T. A. Sellwood, "A Hakataramea arable farm," *ibid.*, 71 (1945) 59–65; P. R. Barrer, "A Cheviot mixed farm," *ibid.*, 68 (1944) 169–173; W. F. Dick, "A Southland dairy farm," *N.Z. J. Agric.*, 71 (1945) 233–242; W. Faithful, "A Southland Chewing's Fescue farm," *ibid.*, 72 (1946) 475–484; W. L. Harbord, "A Southland farm," *ibid.*, 69 (1944) 217–226.

Regions X11 and X12: E. E. Vaile, 'Pioneering the pumice,' 1940; C. R. Taylor, "Farming pumice country," *N.Z. J. Agric.*, 69 (1944) 9–17; *idem*, "A Rotorua dairy farm," *ibid.*, 70 (1945) 399–404; A. T. Shannon and Eva Topping, "Developing a pumice land farm," *ibid.*, 73 (1946) 305–314. It is perhaps significant that as far as is known there are no published descriptions of individual farms in Westland.

Note on the statistical data and maps

The statistics used throughout this paper were, with one exception, taken from the 'Statistical report on the agricultural and pastoral production of New Zealand for the season 1942–1943,' Wellington, 1944. The war did not materially disturb the character of New Zealand agriculture. It did, however, restrict the amount of top-dressing; because imports were not available, the amount of fertilizers used declined from almost 700,000 tons in 1940–41 to half that amount in 1942–43. Figures for grassland top-dressed used here are consequently those of the pre-war year ending 31 January 1939.

Available statistics presented one major difficulty. The smallest unit areas for which data are available are counties. In few cases do the boundaries of New Zealand's 128 counties coincide with boundaries of agricultural regions. Many counties overlap two agricultural regions, or one agricultural region and part of the non-agricultural area. In calculating data for areas coinciding with each agricultural region, those counties occurring entirely within a region were made the basis of the estimation and of the final allotment of data as between any two regions. In the case of counties extending into two or more regions, the estimation of the allotment due to each region took account both of the proportionate area of the parts of counties involved and the characteristics of those parts as demonstrated by adjacent counties entirely within regions. This is not an entirely satisfactory procedure, but in no case of a specific agricultural region were these allotments sufficient materially to affect the force of final regional data.

Much of the available Dominion-wide statistical data has been converted into maps. Some more important of the cartographic representations of this data are reproduced here. The dot maps were drawn independently as soon as the 'Statistical report' covering the 1942–43 season became available. Subsequently dot-distribution maps of dairy cows in the North Island and of sheep in both Islands were published (see W. M. Hamilton, 'The dairy industry in New Zealand,' p. 56, and New Zealand Department of Agriculture, *Bulletin*, no. 252, pp. 76 and 78). Dr. Hamilton's valuable and accurate maps were a welcome innovation in the literature descriptive of New Zealand agriculture. The only other maps showing livestock distributions previously available were by comparison either coarse and generalized (see H. Belshaw *et al.*, 'Agricultural organization in New Zealand,' pp. 46 and 48; and Oliver Duff, 'New Zealand now,' 1941, pp. 48–49), or based on data collected almost twenty years ago (R. O. Buchanan, 'The pastoral industries of New Zealand'). Although the present maps were drawn before Dr. Hamilton's were published, the differences are not striking or significant. The dot-distribution maps included in these pages, other than of dairy cows and sheep, are (as far as is known) the first of their kind to be published except for two small-scale maps of wheat acreage drawn on the basis of different data (see F. W. Hilgendorf, 'Wheat in New Zealand,' 1939; and Kenneth B. Cumberland, 'Atlas of geography,' 5th ed., 1947, p. 20).

THE POPULATION OF ASHANTI: A GEOGRAPHICAL ANALYSIS

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THE GEOGRAPHER'S CONTRIBUTION to the study of demographic problems is being increasingly regarded as both valuable and distinctive. Nowhere should his work be more important than in those colonial territories where the pressure of population upon resources is amongst the most urgent and fundamental of problems. Unfortunately the published census figures in most British colonies—indeed, in all tropical countries—are quite inadequate for the purposes of the geographer; moreover they are often incomplete and, worse still, inaccurate. A study of the population of Ashanti, the central of the three administrative units of the Gold Coast in West Africa, illustrates both the difficulties and the possibilities of geographical analysis as well as the need for a geographical approach to population problems.

There have been five censuses in the Gold Coast since 1891,[1] but only four of these have applied to Ashanti; and of these four, the first—that of 1901—was taken only a short time after the end of the last of the Anglo-Ashanti wars, so that it could hardly be expected to be anything more than an intelligent guess. The decline in the total population of Ashanti between 1901 and 1911—from 346,000 to 287,000—is, therefore, probably more apparent than real. Of far more significance has been the subsequent increase in the African population from 287,000 in 1911 to 406,000 in 1921, an increase of 41 per cent., and from 406,000 in 1921 to 578,000 in 1931, a further increase of 42 per cent. For the purpose of this paper non-Africans can be ignored: in 1931 they numbered only 624, mainly Europeans, Syrians and Indians. Since 1931 no population figures are available apart from estimates obtained by purely mechanical methods on the basis of the average annual increase for the period 1921–31. On this assumption, it is suggested that Ashanti's population was about three-quarters of a million at the beginning of the war and is to-day in the region of 900,000; that is, an increase of over 50 per cent. since the last census. A census is now planned for early in 1948,[2] to be a kind of "pilot census" for the 1951 censuses proposed for the other British West African dependencies.

Such is, briefly, the history of census-taking in Ashanti. In what follows, frequent reference will be made to the official statistics, especially those of

[1] This paper was read to Section E of the British Association for the Advancement of Science at its meeting in Dundee in 1947. Since then a sixth census of the Gold Coast has been taken, in February 1948. There is a note on the census at the end of this paper.

[2] The census was taken, as far as possible, on 8 February 1948 throughout the Gold Coast. Preliminary figures give a total population (including non-Africans) of 4,095,276 for the Gold Coast, compared with 3,163,568 in 1931, an increase of 29·5 per cent.; and of 823,672 for Ashanti, an increase of 42·3 per cent. since 1931.

1931, but without any suggestion that these figures are even approximately accurate. The degree of inaccuracy may indeed be of the order of 50 per cent. in some cases. It needs to be remembered that in the 1921 census some Gold Coast villages in the Northern Territories were counted by dropping into a calabash a grain of maize for ever male person and a cowrie-shell or a palm-kernel for every female, and that 1931 was the first occasion when educated enumerators ("literate" might often be a truer adjective than "educated") were used throughout.[1] There must be many errors, often gross errors, however impressive the figures look on paper and in blue-books; yet, in default of other or more reliable figures, they are better than no figures at all and are far less misleading than the casual, superficial impressions of officials and travellers that lack any statistical background. However, the statistics by themselves would not be of very great value, and much of this paper is based upon observations made during some fairly extensive travels in Ashanti during 1945 and 1946 as a member of the Ashanti Social Survey under the auspices of the Sociological Department of the West African Institute of Industries, Arts and Social Science.[2]

The geographical background of the population of Ashanti can be briefly summarized.[3] A line of hills, often known as the Mampong scarp, runs north-west to south-east from Wenchi through Mampong to the Juaso district and divides Ashanti into two—a plateau in the south and the lowlands of the Volta and some of its right-bank tributaries in the north. What may for convenience be termed "northern" and "southern" Ashanti provide two very different environments for settlement and economic development, differences that are also clearly visible in population maps. Climatically the differences, according to the statistics, are only slight: Wenchi in the north, for example, has 53 inches of rainfall, while Bekwai in the south has 62 inches, and mean monthly temperatures at most stations vary between 75° and 83° F. But the exposure of the district north of the scarp to the desiccating harmattan wind from the north-east results in a clear-cut vegetational division. Much of the south is still covered with closed forest, rain-forest of a mixed deciduous type, notwithstanding the extensive clearing of the forest for farming and settlement. The north is for the most part open, rather degraded, savannah-forest country. Thus the south is generally humid and suffers from excess of water during much of the year, while the north has a low relative humidity, very high evaporation and a shortage of water for most of the year.

These physical differences result in contrasted agricultural development.

[1] A. W. Cardinall, 'The Gold Coast, 1931,' p. 125, Accra, 1932. A significant footnote to the official paper giving provisional figures for the census of 1948 states that the figures for the Cape Coast administrative district of the Gold Coast Colony—one of the most advanced districts—include "an estimate of 7940 males and 8160 females in villages where census information was refused." The difficulties of census-taking in West Africa are discussed at length in R. R. Kuczynski, 'Demographic survey of the British Colonial Empire,' vol. 1, West Africa (1948); pp. 389–541 refer to the Gold Coast and Togoland.

[2] See M. Fortes, R. W. Steel and P. Ady, "Ashanti Survey, 1945–46: an experiment in social research," *Geogr. J.* 110 (1947) 149–79.

[3] Cf. *ibid.*, especially Figs. 1, relief and drainage; 2, vegetation; and 3, main communications.

Southern Ashanti produces a variety of food crops—plantains, root crops (including cassava, cocoyams and yams) and grains like maize—whereas the north as yet grows little more than yams and guinea corn. Economic crops that flourish in southern Ashanti, like kola-nut and, above all, cocoa, are impossible to grow in the north. Again, while the north appears to have no

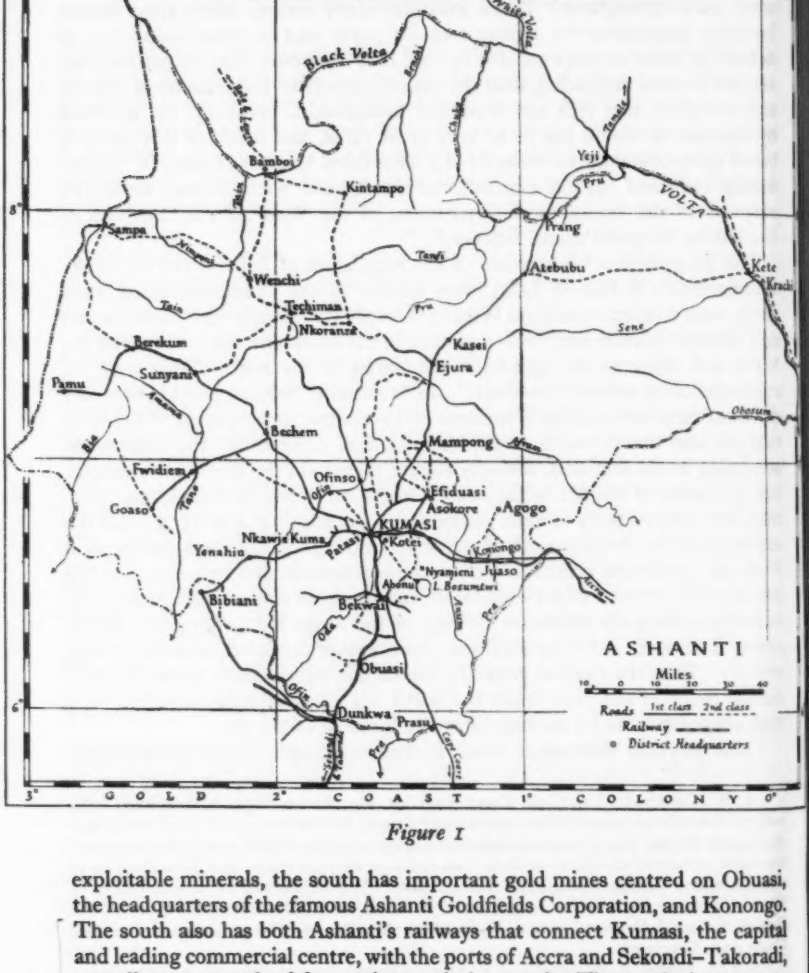


Figure 1

exploitable minerals, the south has important gold mines centred on Obuasi, the headquarters of the famous Ashanti Goldfields Corporation, and Konongo. The south also has both Ashanti's railways that connect Kumasi, the capital and leading commercial centre, with the ports of Accra and Sekondi–Takoradi, as well as a network of first and second-class roads. The north, in contrast, is served by little more than the trunk roads that link the Northern Territories with Kumasi and the coastlands (Fig. 1).

It is therefore reasonable to anticipate a concentration of population in the southern plateau with its ample rainfall and water-supply, its favourable natural vegetation, and its considerable agricultural and mineral possibilities. The north, more isolated, commercially less productive, extensively flooded for one or two months but parched and waterless for the rest of the year, is far less likely to carry much population. This in fact is the general picture presented by such population maps of Ashanti as have so far been prepared. The one that has received the widest publicity is that based on the 1921 census.[1] It covers the whole of the Gold Coast, but Fig. 2 reproduces only the Ashanti section of the map with a modification of the original legend. It appears to give a surprisingly detailed picture of population distribution, but on analysis it proves to be a cartographic representation not of the census statistics but of the impressions of officials and travellers of that date. The roads and railways of 1921 have been superimposed on the official map to suggest the method of compilation. Changes in density do not coincide with administrative (or any other) boundaries but with a diminution in the knowledge of the officials of the day. Administrative officers were able to estimate, probably fairly accurately, the density of population in the districts with which they were familiar; that is, the areas within 10 or 12 miles of the roads and tracks that they normally followed and within 15 miles or so of their headquarters. Beyond, information was lacking and it was safer to state "less than 10 per square mile." The Kumasi area is given the high density of 150 per square mile, and all the roads leading from Kumasi are shown as passing through well-populated parts. The down-grading north of Mampong roughly coincides, it would seem, with the then northern limit of the cocoa-growing area. In the little known, inaccessible and difficult eastern district no attempt at a guess was made except along a belt on either side of the track that led from Atebubu to what was until 1914 the German Togoland station of Kete Krachi. Round Goaso the population distribution map might easily be mistaken for a map showing those areas that lay within 10 miles of the tracks maintained for administrative purposes.

This map then, for all its detail and impressiveness, is somewhat bogus. It is a sobering reflection that it was largely on the basis of this map that the proposals for a railway extension from Kumasi to the Northern Territories were turned down,[2] though it is satisfactory to find that population distribution was considered, however inadequately, as a factor relevant to railway construction by the officials of twenty years ago and not one to be entirely ignored as has been the case in some colonies.[3] A revision of the map based on the published statistics, though much more generalized, is more in keeping with the facts; it is not reproduced here since its main features closely

[1] It appears in numerous official publications and is the basis of the map of the distribution of population in the Gold Coast given in W. Fitzgerald, 'Africa: a social, economic and political geography of its major regions,' p. 352, London, 1934 and later editions.

[2] Cf. 'A project for the construction of a railway between Kumasi and the Northern Territories of the Gold Coast' (Gold Coast Sessional Paper No. 23 of 1927–28), Accra, 1928.

[3] Cf. C. Gillman, "A population map of Tanganyika Territory," *Geogr. Rev.* 26 (1936) 372.

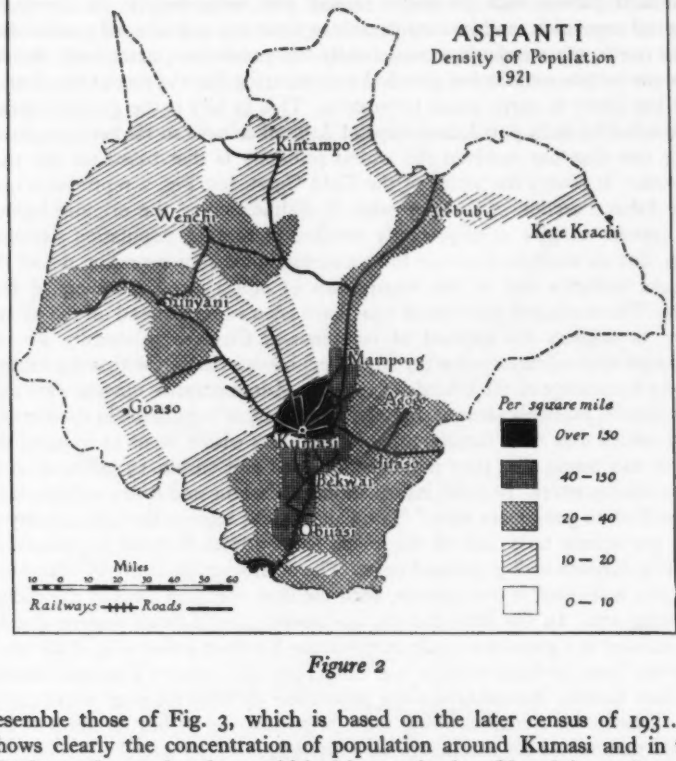


Figure 2

resemble those of Fig. 3, which is based on the later census of 1931. It shows clearly the concentration of population around Kumasi and in the district to the south, where gold had been mined at Obuasi from 1897 and where cocoa was grown extensively in the belt along the railway that reached Kumasi from Sekondi in 1903. Cocoa had been introduced even earlier in south-eastern Ashanti, but full-scale production was impossible until the railway from Kumasi eastward through Juaso to Accra was completed in 1923. Gold-mining at Konongo, also in the south-east, was only in the prospecting stage in 1921 and for some years later. This lack of development explains in part the sparsity of population in the Ashanti-Akim (Juaso) district (7 persons per square mile in 1921), though it is also due to the fact that the district includes much of the uninhabited plains of the Afram, a tributary of the Volta. No large part of Ashanti in 1921 had more than 20 persons to the square mile except for the Kumasi and Obuasi–Bekwai districts. Kintampo district (5·7 per square mile) and Ahafo, the district round Goaso (4·9), had even fewer people than Ashanti-Akim.

Between 1921 and 1931 there were important changes in most parts of Ashanti. They are summarized in the facing table.

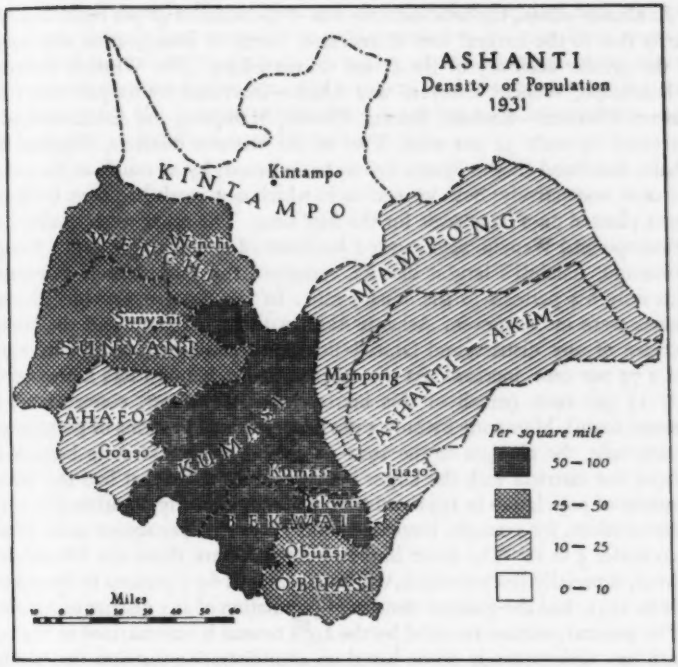


Figure 3

Population (African only) of Ashanti by Districts

District	*Area (sq. miles)* (1931)	*Population* (1921)	*Population* (1931)	*Density per sq. mile* (1921)	*Density per sq. mile* (1931)
Kintampo . .	5,141	28,782	43,410	5·7	8·4
Ahafo . .	1,434	9,256	15,766	4·9	11·0
Ashanti-Akim .	4,580	29,757	55,235	7·0	12·1
Mampong . .	3,349	47,491	59,295	11·9	15·0
Sunyani . .	2,416	36,672	66,976	18·1	27·7
Wenchi . .	2,077	39,039	58,106	18·2	28·0
Obuasi . .	1,040	66,082	39,718	26·9	38·1
Bekwai . .	1,164		76,366		65·3
Kumasi . .	3,169	149,114 [1]	172,196 [2]	54·63	54·4 [4]
WESTERN PROVINCE [5]	11,068	113,749	184,268	10·3	16·7
EASTERN PROVINCE [6]	13,311	292,444	393,810	21·7	29·6
ASHANTI . .	24,379	406,193	578,078	16·7	23·7

[1] Including Kumasi town (population 23,694).
[2] Including Kumasi town (population 35,829).
[3] 45·9 without Kumasi town.
[4] 43·0 without Kumasi town.
[5] Kintampo, Ahafo, Sunyani and Wenchi.
[6] Ashanti-Akim, Mampong, Obuasi, Bekwai and Kumasi.

As already stated, the total increase was of the order of 42 per cent.: this was partly due to the natural rate of increase, partly to immigration and partly to the greater accuracy of the actual census-taking. The Western Province —Kintampo, Wenchi, Sunyani and Ahafo—increased by 62 per cent.; the Eastern Province—Kumasi, Bekwai, Obuasi, Mampong and Ashanti-Akim—increased by only 34 per cent. Two of the western districts, Sunyani and Ahafo, increased (if the figures are to be believed) by as much as 82 and 70 per cent. respectively; both were areas in which new roads had been built and cocoa planted on a large scale for the first time. The other western districts, Kintampo and Wenchi, also showed increases of about 50 per cent., though Kintampo, Ashanti's largest district, remained the least densely populated with only 8·4 persons to the square mile. In the Eastern Province the increases were more uneven. Ashanti-Akim with 85 per cent. had the largest increase of any district, and Obuasi–Bekwai (a combined district in 1921) had a 75 per cent. increase. At the other extreme, Kumasi had increased by only 15 per cent. (much of this increase was, moreover, concentrated in Kumasi town), Mampong by only 5 per cent. Viewed in terms of persons per square mile, the changes of the 1921–31 period are less striking because in general the districts with the larger increases were those that had the lowest densities of population in 1921 and were still only sparsely populated in 1931. Ashanti-Akim, for example, increased from 7·0 to 12·1 per square mile, Ahafo from under 5 to 11. The most impressive figures are those for Obuasi and Bekwai, especially Bekwai which, with an average of 65·3 persons to the square mile in 1931, had the greatest density of population of any district in Ashanti.

The general position revealed by the 1931 census is summarized in Fig. 3,[1] which has, unfortunately, to be based on administrative districts that are far too large (Kintampo, the largest, exceeding 5000 square miles and even the smallest, Obuasi, exceeding 1000) and that include widely differing tracts of country. Ashanti-Akim and Mampong, for example, are just as densely populated in their southern cocoa-producing areas as the adjoining parts of Kumasi and Bekwai, but their general densities are low (12 and 15 respectively) because of the extensive uninhabited sections of the Afram plains that they include. The map as a whole, however, is scarcely an advance on that of 1921; it shows merely a filling-up and an up-grading of the earlier maps, and though it illustrates the concentration of population in southern Ashanti, it fails to bring out the overwhelming importance of the cocoa-growing and gold-mining districts at all adequately. It is imperative, therefore, that the statistics should be further broken down in some way.

Unfortunately the 1931 census classified towns and villages not so much on a territorial basis as according to their allegiance to the various native states and chiefs; and in any case most state boundaries are ill-defined, so that no precise, or even approximate, figures of area are available. Many states are split up and, like some English counties in former days, have numerous "outliers" of territory. Certain village names occur again and again, even within the same district, so that some places cannot be identified with any certainty. There are moreover 2439 towns and villages listed in the reports

[1] Fig. 3 is based on the map published by the Gold Coast Survey Department, reproduced as Map 7 in the 'Atlas of the Gold Coast' (4th ed., Accra, 1945).

46 per cent. of these had fewer than 100 persons and 70 per cent. had less than 200. Less than 10 per cent. of the total population in 1931 lived in communities of more than 500 persons.[1] Thus any detailed analysis of the census figures must of necessity be long and arduous, and as these figures are now seventeen years old it seems advisable to postpone such investigation until the final census figures of 1948 become available.

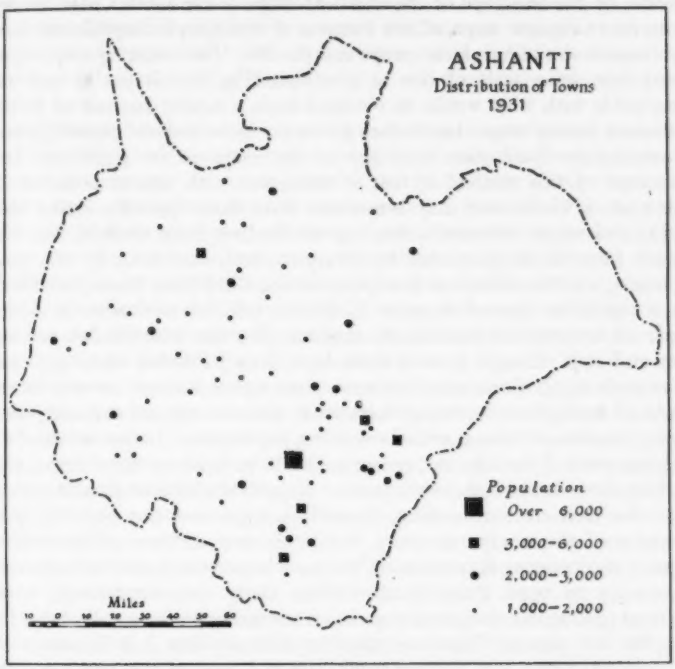


Figure 4

It is however comparatively easy to analyse the distribution of the larger centres of population. In 1931 there were 85 settlements with more than 1000 people (Fig. 4). They "cluster" (if the term be admissible) in the south-eastern quadrant where are the railways and the chief roads, the cocoa farms and the gold mines, and the heat and humidity that induce tropical luxuriance. Within individual districts, they show clearly where population is concentrated; in Mampong and Ashanti-Akim, for example, there is the obvious contrast between the cocoa areas with the towns, and the almost uninhabited Afram plains. But the north and west are not without towns—towns moreover with ancient foundations, like Wenchi or Kintampo, that were important markets long before the motor-road and cocoa transformed

[1] 'The Gold Coast, 1931. Appendices containing comparative returns and general statistics of the 1931 census,' Accra, 1932.

some of the villages of the south into embryo towns during very recent years. And whereas those of the south are usually limited in their influence by the proximity of nearby centres, several of the northern towns are supreme in their isolation and show far more "soul," more "civic consciousness," than some of the mushroom growths of the south.

A further method of discovering the real distribution of population is made possible by the existence of the excellent maps of the Gold Coast Survey. From its 1:125,000 maps, all the features of demographic significance have been traced—buildings, farm camps and the like. The resulting map, reproduced here on a scale of one in a million (Fig. 6),[1] is not in any way comparable with what would be obtained from a similar analysis of British Ordnance Survey maps; but it does give a far more realistic general picture of population distribution than any of the maps so far published. One advantage of this method is that it deals, not with figures collected by enumerators whose aim may sometimes have been quantity rather than quality and whose informants may not always have been truthful, but with definite material things plotted by surveyors; and, moreover, by very good surveyors, whether African or European, for the Gold Coast Survey justifiably has a reputation second to none in British colonial territories in Africa. There are however drawbacks to this method. The sheets vary in date between 1927 and 1946, though most of them have been published since 1931 and many since 1935. Some are little more than reconnaissance surveys hastily produced during the war, though fortunately the areas covered so inadequately are the districts of Ashanti with the smallest populations. In one or two of the outlying parts of the country, recourse had to be made to other maps, particularly those on the scale of 1:250,000. Happily the areas of densest population—the districts surrounding Kumasi—are covered not only by good examples of the 1:125,000 series, but by revised editions of the original sheets;[2] that covering Kumasi itself, the most important sheet of all, appeared as recently as 1946. Personal observation along the motor-roads, where the most spectacular changes of population are taking place, has also helped to complete the picture. There remains the difficulty that it is impossible to say precisely what each dot represents, since a map of this scale must be largely conventional in its reproduction of towns, villages and individual buildings. Thus a dot may represent an isolated farm camp in the newly opened western districts of Ashanti or twenty or more buildings in a town like Kumasi. Nevertheless it can be claimed that this map, with all its shortcomings, does give some indication of the pattern of population and settlement and shows information that is available in no other way. It is proposed to correlate this map with the data of the 1948 census when the latter become available, and to use it as a basis for more detailed studies of the relationship between population and other geographical factors.

Three main causes of the very considerable increase in the figures of population in recent years have been suggested: more accurate counting of

[1] This map was compiled by Mrs. Audrey Boddy. It represents many hours' work and involved detailed study of the 1:125,000 sheets besides other sources.

[2] The sudden thinning of the dots on the map coincides with the northern edge of these sheets.

people, the natural rate of increase, and immigration. Some of the increase is undoubtedly due to the fact that fewer people avoid being counted in each successive census, but it is quite impossible to say what proportion is accounted for in this way. With regard to the natural rate of increase, information is of the scantiest. No one has any clear idea what the net reproductive rate is. Registration of births and deaths is carried out in only a few urban districts of Ashanti. A fertility census taken in the town of Agogo by Dr. M. Fortes during the Ashanti Social Survey suggests that the net reproductive rate is of the order of 1·9 per cent.[1] This figure may be too high, but if it is anywhere near the truth it means that the population will double itself in thirty-five years.

Immigration has been made possible, and necessary, by the economic revolution brought about by cocoa and gold during the present century. Cocoa was introduced to Ashanti during the last decade of the nineteenth century in the Bompata district in the south-east. Production by 1914 was about 11,000 tons per annum. During the late 'twenties exports averaged 60,000 tons. In 1936, the peak year, Ashanti produced 91,000 tons, nearly one-third of the total Gold Coast export of that year. And with the appearance of the disease known as "swollen shoot" in many parts of the Gold Coast, including Ashanti, but more especially in the Eastern Province of the Gold Coast colony (at present the chief producing area), it seems that Ashanti's contribution to the total output may increase appreciably in the future. A survey for 1944–45 showed how widespread was the distribution of cocoa farms in Ashanti.[2] In fact there are farms wherever ecological conditions make possible the cultivation of cocoa, and cocoa has been instrumental in transforming the whole economy of Ashanti during the past fifty years.

Gold-mining began in 1897 at Obuasi, the headquarters of the Ashanti Goldfields Corporation, around what is reputed to be the richest square mile in the world. The developments at Konongo have come later, mainly since 1933, and are on a much smaller scale, though future prospects are believed to be excellent. To-day 10,000 or more labourers are employed in mining in Ashanti, while just beyond the southern boundary, at Bibiani, there are more gold-mines that draw largely upon Ashanti for labour and food supplies. In the future, bauxite mining is likely to begin at Yenahin on the recently completed road from Kumasi to Bibiani.

Cocoa and gold have thus created large demands for labour which have strongly reinforced the age-old southward movement of the peoples of West Africa. All the heavy manual work at the mines in Ashanti is to-day performed by non-Ashanti labour, and more and more Ashanti-owned cocoa farms are being worked by hired labourers from the north. To-day every Ashanti town, and almost every Ashanti village, has its "zongo" or immigrant quarter, which in places like Kumasi and Obuasi holds several thousand northerners. The zongo population far outnumbers the Ashanti in northern towns like Kintampo, Wenchi, Atebubu and Ejura. There is a constant

[1] M. Fortes, "The Ashanti Social Survey: a preliminary report," *Human Problems in British Central Africa* (The Rhodes-Livingstone Journal), 6 (1948) 10.

[2] The distribution of cocoa areas in Ashanti is shown in *Geogr. J.* 110 (1947) 157 (Fig. 5).

movement of peoples along the great north–south trunk roads that converge on Kumasi, and across the Volta ferries at Bamboi and Yeji, and though there is a northward movement of returning workers, the southward traffic is generally far in excess.

During recent years there has been a marked increase in the number of the towns of Ashanti and in the size of many of these towns. In 1911 Kumasi alone had more than 2000 inhabitants. By 1921 there were 8 other such towns; by 1931 there were 25, and to-day there may be as many as 40 (Fig. 4). Towns can offer services like water-supply, market facilities and schools that are unattainable in the villages, and the Ashanti people are showing themselves fully aware of this fact. Agogo in the Ashanti-Akim district of south-eastern Ashanti, for example, was little more than a small frontier-post on the edge of the Afram plains some forty or fifty years ago. To-day it is a thriving end-of-the-road market town with about 4500 inhabitants according to a simple census taken in March 1946.[1] Its growth in twenty years is roughly indicated by a comparison of the first and second editions of the 1 : 125,000 sheet of the Gold Coast Survey covering Agogo (Fig. 5). This comparison shows even more strikingly the growth of the mining town of Konongo. In 1931 Konongo had 2686 inhabitants, less than its neighbour Odumasi which had 2841; but a census taken in 1946 showed 5712 in Konongo and 3834 in Odumasi, a total of 9546 for the twin towns. What is especially interesting about these figures is that of the total only 55 per cent. was Ashanti; 25 per cent. consisted of immigrants from the north, mainly mine-workers and cocoa-labourers from the Northern Territories of the Gold Coast and from adjacent parts of French West Africa; and 20 per cent. came from the south, mostly clerks and storekeepers. The growth of Kumasi, the capital, has been more spectacular still. In the nineteenth century it seems to have been a typical African town of perhaps 10,000 people. Much of it was destroyed in the last Ashanti war (1889–1901), but since then growth has been steady and, at times, rapid. In 1911 its population was 18,000; in 1921, 23,000; in 1931, over 35,000; to-day it must be at least 60,000 and is more probably in the neighbourhood of 70,000.[2] Suburbs have grown up along the main roads that radiate to all parts of Ashanti, and the town shows all the evils of overcrowding, housing shortage, traffic congestion and unplanned development even though it still deserves, in many respects, its title of "the garden city of West Africa."[3]

Communications have had an important influence on the distribution and density of population. Sometimes they have preceded, sometimes followed, agricultural and economic developments. Though there have been no railway extensions in Ashanti since 1923 and none is planned, road building has been

[1] For Agogo, see *Geogr. J.* 110 (1947) 149–79, especially Figs. 4 and 6.

[2] Preliminary figures of the 1948 census give Kumasi a population of 70,705 (including 773 non-Africans). The figure for Accra, capital of the Gold Coast, has doubled since 1931, from 60,726 to 135,456 (including 2712 non-Africans) on a slightly larger area.

[3] There is a plan of Kumasi in *Geogr. J.* 110 (1947) 162 (Fig. 7). Proposals for its replanning were put forward by the Town Planning Adviser to the Minister Resident in West Africa; see E. Maxwell Fry, "Town planning in West Africa," *African Affairs, J. Roy. African Soc.* 45 (1946) 199.

continuous and roads to-day might almost be said to set the pattern of settlement. So much are the benefits of a roadside position appreciated that literally scores of new villages are growing up along the roads; and villages off the roads, in contrast, are stagnating and have sometimes been abandoned altogether. The Ashanti-Akim district again shows what has been happening over twenty years (Fig. 5). The skeleton of roads in 1925 has become a network by 1945. New roads have led to a dispersal of settlement, and new cocoa farms have become economically possible over wide areas. Roadside villages have become towns; older, now isolated, villages have declined in population.

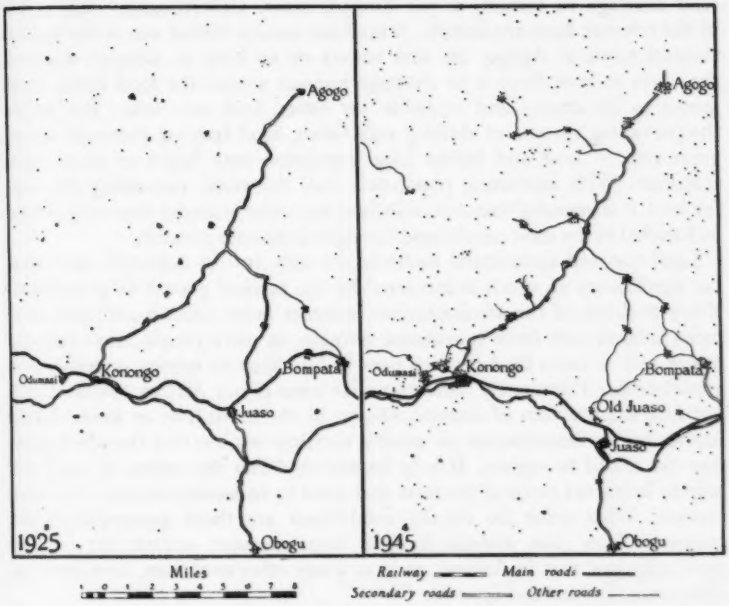


Fig. 5. Part of Ashanti-Akim district, showing changes in communications and distribution of population, 1925–45.

The straight new Konongo–Juaso section of the Kumasi–Accra road has opened up previously uninhabited areas. At Juaso a new town has been planned alongside the railway (opened in 1923), leaving Old Juaso to house only the District Commissioner, his clerks and the police. The Konongo–Odumasi mining settlements have grown out of all recognition. In contrast, the historic town of Bompata is declining in size and importance mainly because it is now by-passed by the main road.

The country's increasing population, both Ashanti and non-Ashanti, raises for the first time in acute form various questions concerning the use of the land. What is the best use to which each portion of land shall be put? Shall

it be used for food farming, for cocoa, for roads and buildings? Or shall it be left as virgin forest in the forest reserves now widely constituted by Government, and in which no settlement, farming or timber-cutting is permitted, so that the land, the forest and the soil are safeguarded for future generations? These questions hardly arose in the past when there were plenty of land and not many people. But to-day there is much more land under permanent cultivation. Much more food is needed than ever before to feed the increased population, including an ever-growing number of non-agriculturists. There is therefore a great need for increased food production and for vastly improved marketing facilities. In some quarters fears are being expressed of real land shortage in certain, as yet limited, areas. Unfortunately only a few of the relevant facts are known. A land-use survey carried out in the typical Ashanti town of Agogo, the first survey of its kind in Ashanti, suggests that here at least there is no shortage because around the food farms there seems to be ample land available for either food or cocoa.[1] But under the prevailing system of shifting cultivation, food farming demands a very great area of land and before long population may begin to press upon resources. With increasing population and, therefore, increasing demands for food, it is essential that Ashanti's land and other material resources should be handled in the most careful and far-sighted manner possible.

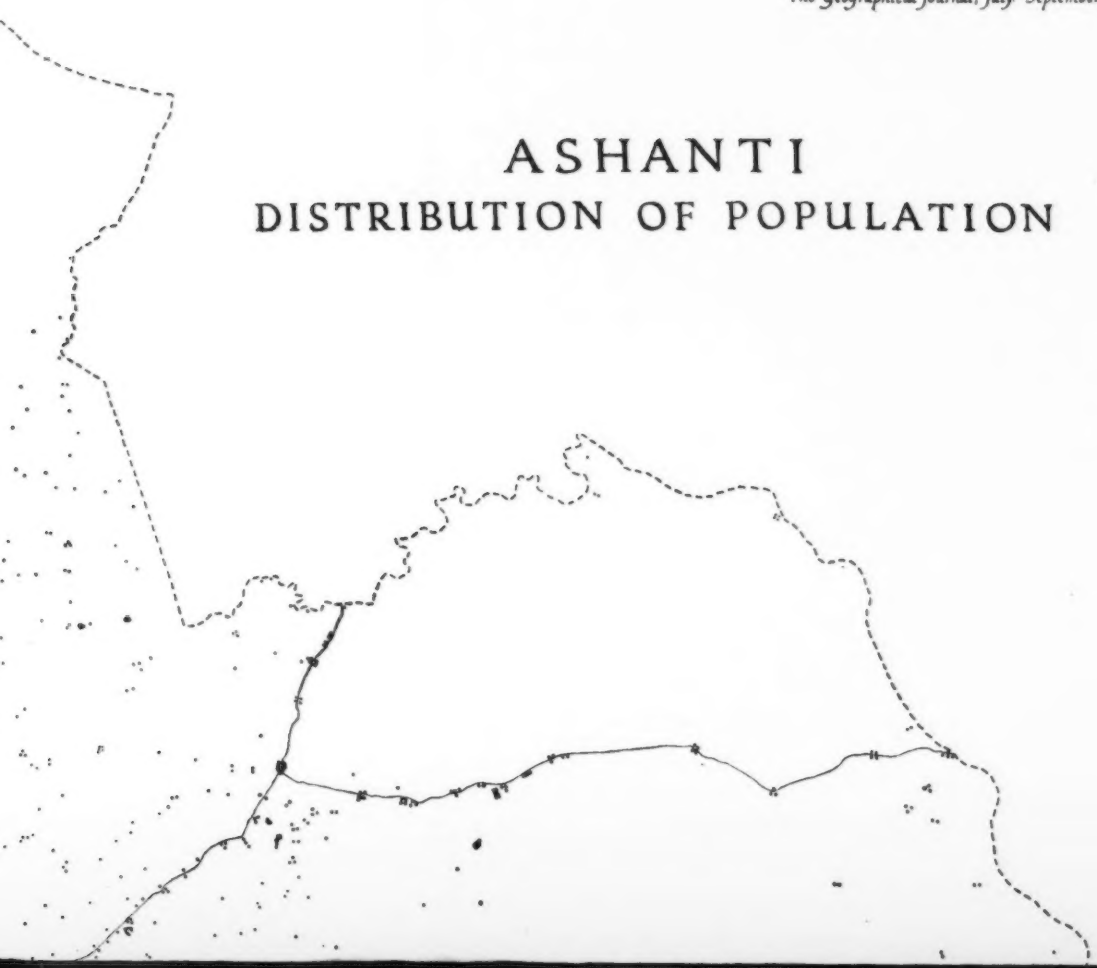
Land-use and agricultural methods are only two of Ashanti's problems, the significance of which is increased by the marked growth of population. Every problem of the administration becomes more difficult and serious as more farmers turn from subsistence farming, as more people move into the towns and as more land is given over to buildings or mining operations or export crops. Fortunately Ashanti, unlike some of our African colonies, does not face the problem of over-population in the immediate or more distant future; but its demographic situation is certainly not one that the administration can afford to neglect. It is to be expected that the census of 1948 will help to bring out some of the facts that need to be known but are at present obscure. What must be equally established are those geographical and economic facts that underlie and, in large measure, explain the facts of population and that in Ashanti, as in so many other countries, have been too often unrecognized and ignored.

Note on the census of 1948

Some figures for the census of 1948 were published by the Gold Coast government while the above paper was in proof. An introductory note states: "These figures are provisional, being derived from preliminary returns prepared by each enumerator and subject only to such check as was possible by local Census Officers. They may be expected, therefore, to differ from the final figures to be tabulated at the Census Office but the differences ought not to be of a serious character." Unfortunately the areas of the census districts are not given and the districts do not always coincide with those of the 1931 census. Bekwai, Obuasi, Mampong and Sunyani are approximately the same areas as those of the same name in 1931; and Kumasi (Juaso) is roughly the Ashanti-Akim of 1931. No information is at present available as to the

[1] Cf. *Geogr. J.* 110 (1947) 155–60 and Fig. 6.

ASHANTI
DISTRIBUTION OF POPULATION



Scale 1/1,000,000
Miles
5 0 5 10 15 20 25 30
Main roads
Buildings shown on 1/125,000 and other maps of the Gold Coast Survey

Figure 6

Bamboi
Prang
Wenchi
Atebubu
Kete Krachi
Techiman
Nkoranza
Pamu
Sunyani
Ejura
Bechem
Mampong
Goaso
Efiduasi
KUMASI
Juaso
L. Bosumtwi
Bibiani
Bekwai
Obuasi
Dunkwa
Prasu
ASHANTI
Miles
25 0 25 50
Main roads
Railway

precise manner in which the Kumasi census district was divided. The figures for the Gold Coast at the foot of the table below comprise the Gold Coast Colony, Ashanti, the Northern Territories and Togoland.

Census district	*African*	*Non-African*	*Total*	*District headquarters*	*Total*
Bekwai . .	87,851	29	87,880	Bekwai	4,499
Obuasi . .	64,433	186	66,619	Obuasi	15,833
Kumasi 1 .	89,005	812	89,817		
Kumasi 2 .	79,420	—	79,420	Kumasi	70,705
Kumasi 3 .	69,741	3	69,744		
Kumasi 4 .	83,696	10	83,706		
Kumasi (Juaso)	63,068	100	63,168	Juaso	1,862
Mampong .	102,754	22	102,776	Mampong	3,967
Sunyani . .	107,341	21	107,362	Sunyani	4,670
Wenchi . .	73,176	4	73,180	Wenchi	3,812
ASHANTI . .	822,485	1,187	823,672		
GOLD COAST .	4,088,503	6,773	4,095,276		

REGIONAL PLANNING IN AUSTRALIA

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THE GROWTH OF regional consciousness in Australia has become quite marked and from time to time it is vocal and practical. Very early in Australian history New Zealand severed its connection with New South Wales and soon there were six separate colonies, now states, and several territories. It is not generally realized how large are these states in comparison with those of other countries; for example, those of Canada and the United States of America. In the United States, Texas is the largest state with 263,644 square miles. Of the forty-eight states, eight have less than 10,000 square miles, nineteen others have about 50,000, and seven have about 100,000 square miles. In Canada each of the eleven provinces has rather more than 200,000 square miles. In Australia, the areas of the states in square miles are as follows: New South Wales, 309,433; Victoria, 87,884; Queensland, 670,500; South Australia, 380,070; Western Australia, 975,920; Northern Territory, 523,620; Tasmania, 26,215. This factor of size and the consequent sense of remoteness have in the past been instrumental in bringing about the present states, and more recently there has been considerable demand for new states, notably in the Northern Territory, the New England district of New South Wales,[1] Western Australia and Queensland.[2] Contemporaneously with this desire for smaller states, strengthened by the growth of federal authority, an increase in centralization has taken place within each state. There have recently been two Commonwealth-wide referenda seeking to increase still further the powers of the central federal government, which in itself may be a logical outcome in a maturing Australia.

During World War Two a serious lack of precise information was felt in government departments and probably hindered the proper prosecution of the war. In many country districts the spirit of self-help engendered by Volunteer Defence Corps, Air Raid Precautions and the raising of funds for war purposes resulted in the formation of leagues for fact-finding to help and spur on the work of local development and local government and to impress central authorities with the need for new public works for the returning servicemen and women. Some local municipal and shire councils (local government areas) have for a number of years been preparing privately plans for the orientation and future development of their areas. An outstanding example is that of Shepparton in Victoria.[3] Furthermore town planning by trained town planners is becoming recognized and practised, and public administration is taking on a new aspect.

[1] 'Report of the Royal Commission on new states,' Parliamentary Papers, New South Wales Government, vol. 3, 1934–35. Sydney, 1935.

[2] For an early attempt to make seven states in eastern Australia, see John Dunmore Lang, 'Freedom and independence for the golden lands of Australia,' London, 1852.

[3] 'The Shepparton plan,' Shepparton, 1946. A Government plan has been prepared for the new Darwin, Northern Territory.

This appreciation of administrative regionalism is therefore new in Australia. It developed during the war, especially in response to such needs as that for pooling machinery and food supplies in War Agriculture Regions. A great step forward took place in December 1943 when the Premier of New South Wales set up a committee "to furnish . . . a report and design for the subdivision of the State into regional areas. . . . It is proposed to set in hand a regional survey of the resources of the State with a view to facilitating planned development, notably in connection with housing and public works, but also to provide a basis for investigation, *inter alia*, of the employment structure, decentralisation, and primary and secondary industry." [1] This committee interviewed or obtained information from the state departments, statutory bodies, local leagues, local government departments and individuals to an extent that was almost exhaustive. A full report containing thirty-six maps was issued. Included in the report was a proposal to subdivide the state into seventeen regions, exclusive of the western third of the state which is at present under a form of regional administration—the Western Lands Commission. In the same year 'The geographical basis of government' [2] was published, in which I discussed the general principles of regionalism in Australia and set out forty-eight geographical regions for New South Wales and a method of combining them into large regions.

In April 1944 the Victorian Cabinet appointed a State Regional Boundaries Committee "To make enquiries and to submit recommendations as to the regional boundaries which might be adopted in the State of Victoria." Later that year the Victorian Committee, incorporating the recommendations of a Premiers' Conference, produced a report and plan for the subdivision of Victoria.[3] This report contains thirty-two large-scale maps setting out in detail the distribution of geographical factors and human activities in Victoria. As a result of the Committee's work Victoria was divided into thirteen regions.

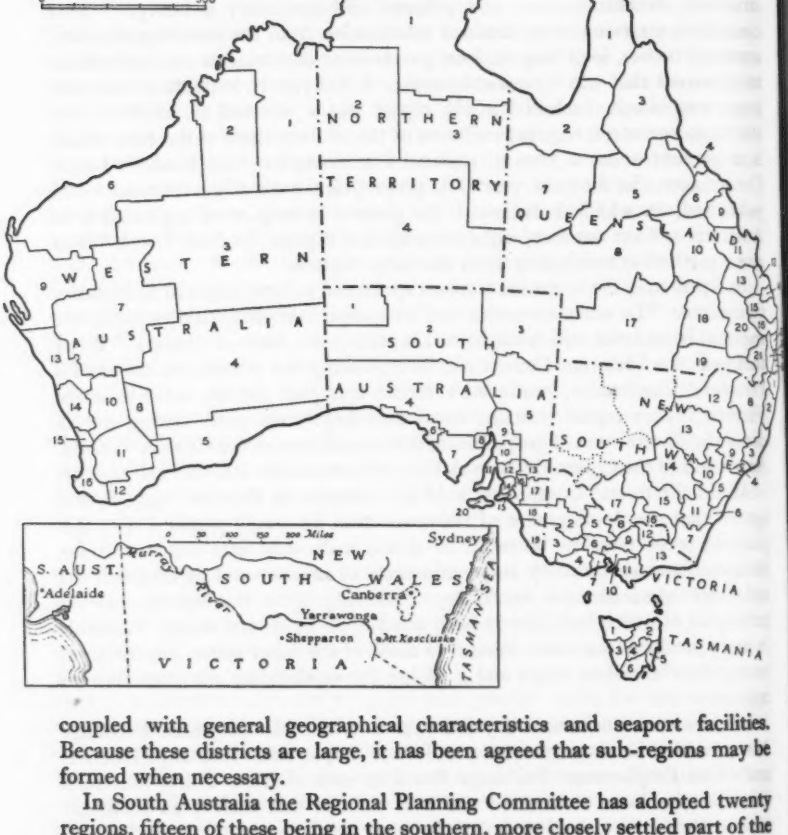
At the Premiers' Conference held in Canberra in October 1944, it was agreed that the development of resources must be wisely planned. For this purpose steps were to be taken to divide each state into regions having economic and social unity and community of interest and to establish the necessary administrative machinery. Following upon this agreement, the principles of which had already been acted upon by several states, Tasmania in 1945 produced an atlas [4] similar to those of the other states, consisting of twenty-four excellent maps and a design for subdividing the state into six regions.

In Queensland between 1915 and 1941 a series of Employment Exchange Acts provided for the establishment of State Employment Exchange Districts and of an Employment Exchange Board in each district. Thirty-four such districts have been constituted and it is claimed that each is an economic area as defined by the Bureau of Industry with regard to the industries, the transport facilities and a principal commercial centre in the district. To facilitate the working of the Exchange Districts, a large volume of statistics

[1] 'Report of Regional Boundaries Committee,' New South Wales. Sydney, 1944.
[2] J. Macdonald Holmes, 'The geographical basis of government,' Sydney, 1944.
[3] 'Regional boundaries report . . . Victoria, 1944,' Adelaide, 1944.
[4] 'Regional planning: economic resources of Tasmania,' Hobart, 1945.

and factual information was prepared. When regional boundaries were being worked out, Queensland, on the basis of this information, reassembled the Employment Exchange Districts into twenty-five regional planning districts. It was also proposed to amalgamate the local government areas within each region and to create regional local government with greatly increased powers. In my opinion these are the proper steps to take.

In Western Australia the regional grouping is based on Road Board Districts



coupled with general geographical characteristics and seaport facilities. Because these districts are large, it has been agreed that sub-regions may be formed when necessary.

In South Australia the Regional Planning Committee has adopted twenty regions, fifteen of these being in the southern, more closely settled part of the state and five being in the northern, sparsely settled area. The Committee, while paying close attention to climate, structure, production and unity of interest, took notice of existing well-defined boundaries, especially those of local government areas. The Committee suggested however that: "It should be later arranged by some Federal or Interstate body to examine the regions where they come in contact along State borders, with a view to making such

regions coincide as far as possible, even to the extent of crossing the present State borders." [1] This division of South Australia into five large areas covering about 83 per cent. of the state, and fifteen small areas, is a direct response to the geographical environment in which aridity, internal drainage and sparse pastoral activity characterize so much of the area, while the remainder is divided naturally by mountain ranges, long arms of the sea, and the Murray river gorge and lakes estuary.

In certain states some of the boundary lines would differ had they been the work of skilled geographers, though that is probably not a serious matter at present. The case of the Murray Valley is different since portions of three state boundaries impinge on the river. The position of state regional boundaries is of considerable importance to future development because the regional committees, when they come to be formed, may feel obliged to retain their state-mindedness to the detriment of their local interests. The New South Wales Regional Boundaries Committee reported that the two regions bordering the Murray would function best if they were combined with similar regions on the Victorian side. When the Victorian regions were completed, parts of their boundaries were drawn to conform to the New South Wales units, but they included too much of Victoria outside the Murray Valley.

While this problem of inter-state boundaries was being resolved, I published a small paper [2] setting out a subdivision of the Murray Valley into four regions, ignoring the New South Wales and Victoria inter-state boundary. About this time people living in the Murray Valley formed a league to advance the general welfare of the Valley regions from Kosciusko to the coast, and held a conference at Yarrawonga in August 1944. At this conference and at subsequent meetings, the delegates from the local governing areas accepted in principle this map, which we extended to include South Australia, and decided to form six regions within the Murray Valley covering the majority of the local governing areas bordering the Valley in the three states. The intention of the Murray Valley League is to find some authority which will integrate all six regions and plan the future development of the whole Valley, exclusive of its tributaries, as a regional unit.

In keeping with the work being done in the states, a Regional Planning Section under the Department of Post-War Reconstruction was inaugurated at Canberra late in 1944 and the work is advancing, though somewhat slowly because of difficulties due to the end of the war and general elections. The map opposite depicts the progress in regional division so far achieved in Australia. The majority of the regions have been agreed upon by the several states, but to complete the map and bring it into conformity with general principles already accepted I have made certain additions, mainly in the Western Division of New South Wales and in the Northern Territory.[3]

Following upon the formation of these regions, the states have established

[1] 'Report on regional boundaries,' South Australia. Adelaide, 1946.

[2] "Regional boundaries in the Murray Valley," *Austr. Geogr.*, 4 (1944) 197–203.

[3] 'Report of Regional Boundaries Committee,' New South Wales, 1944; 'Report on the Northern Territory of Australia' (Commonwealth of Australia, Parliamentary Papers, 1937), Canberra, 1937.

regional committees whose "set-up" is promising. The method in New South Wales, which is typical, is as follows. The numerous local government areas in each region appoint delegates to a conference which appoints six aldermen to serve on the regional committee. Later, three or four technical officers from government departments and executives in the region are added by government nomination. And lastly two citizens, chosen from the region for their technical or professional qualifications, are appointed by the ten already elected to make up the balance of a committee of twelve. These regional committees are purely advisory at this stage but they have been instructed to prepare plans for the better organization of their regions and are provided with paid secretarial assistance. In New South Wales they are being supplied by the State Department of Reconstruction and Development with ten regional distribution maps and factual and statistical information to help them appraise the regional resources. It is to be hoped that this presages an increased awareness of the purpose of local government and the new powers that may be necessary for its success. A further advance has been made in the setting up of an authority to prepare plans, within three years, for the redesigning of the Sydney district now reconstituted as the County of Cumberland. An executive planner has been appointed, with a staff which includes a senior geographer, and after six months interim plans and maps have been prepared. In the other states similar progress is being made with many projects which are regional in conception.

Despite the logic of the case as set out in these reports and their accompanying elaborate atlases,[1] and the milestones already passed on the road to regionalism, the next step forward seems difficult to take. Some key government departments do not find it convenient to change their present regional boundaries to conform to the new design. Local shires, municipalities and boroughs fear amalgamation in spite of the fact that very many of them are too weak in powers and in finance to go much farther forward. Sometimes the resistance is from local government office staffs who fear retrenchment, which is not very enterprising on their part since regional government must mean better staffs and better status for their profession. Apart from these temporary difficulties, there is no doubt that the initiative for more local government must come from the people themselves and not from central governments, though parliaments, probably both state and Commonwealth, must eventually pass the enabling legislation. It has been suggested that the next step is to have a parliamentary convention and thereafter a referendum to consider the relationships of Federal, state and regional local government areas to one another.[2]

[1] 'Determination of regional boundaries, New South Wales. Report,' Sydney, 1943; 'Regional boundaries report: State Regional Boundaries Committee, Victoria, 1944.' Adelaide, 1944; 'Regional planning: economic resources of Tasmania,' Hobart, 1945.

[2] D. H. Drummond, 'Australia's changing constitution,' Sydney, 1946.

A THEORY OF BORNHARDTS

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BORNHARDTS, or granite-gneiss inselbergs, have attracted attention from geomorphologists since the time of their description by Bornhardt himself,[1] and attempts to explain their form and occurrence have been many and varied. This is not surprising, for where they are well developed bornhardts often make the most striking features of the landscape (Plate 2). Where they are present in abundance, as in some of the eastern districts of Southern Rhodesia, they sometimes confer upon the landscape a truly awful and mysterious appearance as though the observer had descended upon another planet. Something of their atmosphere was caught by the novelist Rider Haggard.

The writer's good fortune has led him to study many scores of bornhardts in the Union of South Africa, the Rhodesias and the East African territories, and the theory regarding their origin is now sufficiently advanced for publication. To discuss *in extenso* the earlier theories of bornhardt (inselberg) development is beyond the scope of this paper. The writer has tested them all in the field, found them wanting in some respect, and has with their aid evolved the present, eclectic account. Briefly, no single thing, structure or process is responsible for the development of bornhardts. Bornhardts are due to the twin processes of pediplanation (scarp retreat and pedimentation) acting upon suitable rock types, following a geological history which involves stream rejuvenation. Each of these three essential conditions is examined in the sequel.

Bornhardts, in whatever territory they appear, exhibit a homogeneity of form that is striking in the extreme. The family includes the high, domed "inselbergs" of Bornhardt, alone or in groups; the less perfect, more irregular masses sometimes found in ridges, in clumps or isolated; and lastly, the tors or "castle koppies," which are generally smaller, and often a jumble of joint-bounded granite blocks rather than true bornhardts. As might be expected, all gradations appear between the various members of the family, just as all gradations in stage of development are also possible in the planed landscape with which bornhardts and castle koppies are commonly associated. The features generally held in common by bornhardts may now be examined.

(1) Bornhardts are developed only in *rocks of plutonic origin*—plutonic igneous or plutonic metamorphic. Examples are known in various granites, granodiorites, diorites, occasionally in norites and even charnockites, and in a wide variety of orthogneisses and hybrid rocks of plutonic admixture. The rocks must be intrinsically hard and moderately resistant to chemical weathering in order that the faces of the bornhardts shall stand steeply. Thus bornhardts are rarer proportionately in basic than in acid or intermediate rocks.

[1] W. Bornhardt, 'Zur Oberflächengestaltung und Geologie Deutsch Ostafrikas,' p. 31, Berlin, 1900; see also Bailey Willis, 'East African plateaus and rift valleys' (Carnegie Institution, pubn. no. 470), p. 121, Washington, 1936.

However, a suitable rock constitution is not the sole nor even the dominant agency in the development of bornhardts, though it is a necessary one.

One special point may be noted here: bornhardts do not consist of different types or qualities of rock from those of the surrounding country as some authors have suggested. Their margins mark erosional boundaries, not petrological ones.

(2) The significance of the plutonic rock type is seen also in the *numerous curved joints* which often cause shells to exfoliate from the surfaces of bornhardts. These curved joints are of a type associated with "unloading" by removal of the cover from rocks which originated in depth. They are exposed also in deep excavations, fifty or a hundred feet below surface, with indications that they must continue to considerably greater depths, perhaps to hundreds of feet.

As initiators of bornhardts such joints are not important—indeed the bornhardt margins sometimes cut across them; but superficially they exercise considerable influence on the external forms. The steeply curving sides and domed summits of bornhardts are often a direct expression of the curved "relief-of-load" joint systems.

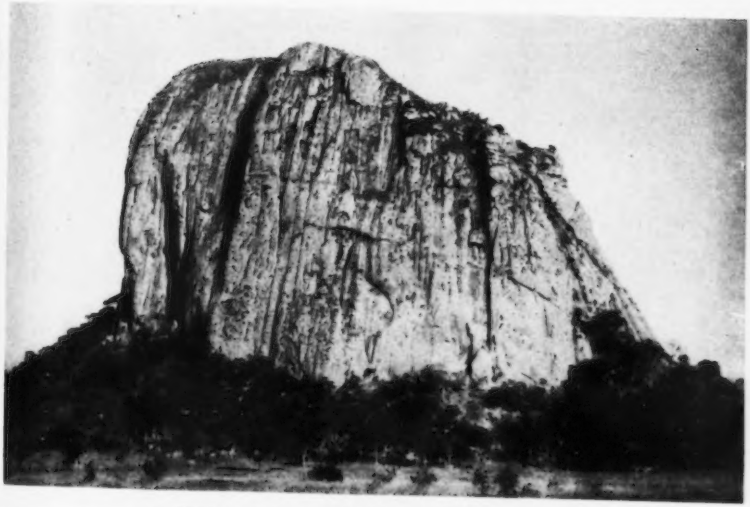
(3) The *normal, sub-rectangular system of joints* commonly found in rocks of plutonic origin exerts considerable influence upon the nature and distribution of bornhardts in two ways. First, if this system of jointing is powerfully and closely developed bornhardts may not be formed at all, for the mountain mass early breaks down into separate angular blocks or piles of roughly rounded boulders. The presence of such a joint system greatly aids weathering, and inselbergs of this type, often called "castle koppies," are never as large as the true whalebacked bornhardts. They make their own distinctive scenery, as may be seen near Marandellas and Macheke in Southern Rhodesia (Plate 1).

Occasionally true bornhardts degenerate during old age into castle koppies. Thus in the smaller bornhardt mass the curved joint system exercises a less effective control upon the external form and weathering is able to etch the mass along the parallel joint systems and break it up. All stages in this degeneration can be seen in the inselberg archipelagoes of eastern Rhodesia and western Uganda.

Secondly, and of greater consequence, is the manner in which the distribution of bornhardts is governed by the patterns of the sub-rectangular joint system. Seen from the air, the Matopos, for instance, show how the streams of that area follow closely the regional sub-rectangular joint systems (Plate 4). Other bornhardt areas are, in general, similar. Thus from the beginning the area is subdivided by the drainage system into compartments, each of which is free to develop into a bornhardt, or group of bornhardts or castle koppies, as its rock texture and structure, under weathering, dictate. The "compartmenting" effect is however no greater than that of trellised drainage in other regions, and although contributory is by no means the dominant agency producing bornhardts. It is doubtful too whether the faces of bornhardts ever follow precisely the original compartment joints. At most such an effect would only be temporary, and I have never observed it.

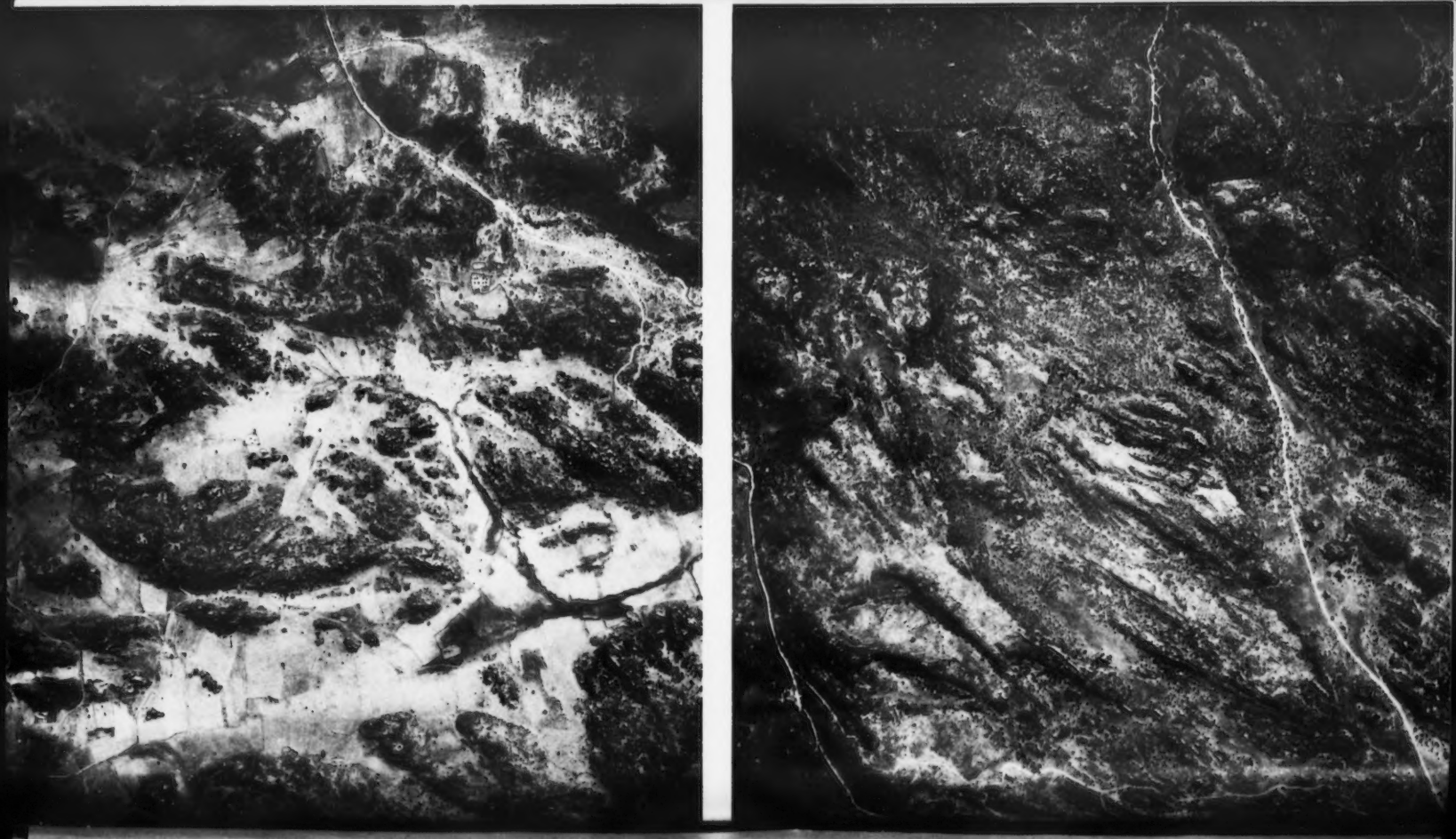
(4) Obst has remarked that *bornhardts are found only where there are traces*

1. Castle koppies at late stage of development



2. Bari, striking example of a true bornhardt

3. Bornhardts near Shazavumu, Tokwe river, Southern Rhodesia



of two cycles of erosion.[1] This observation I have tested over almost the whole of the Rhodesias and East Africa, and have found it true. The Matopos, an archipelago of youthful bornhardts, are typical. Westward, on precisely similar rocks, is the upper plain of the Rhodesian watershed which rises eastwards and south-eastwards as a series of wide bevels on the more westerly Matopo hills. From the south-eastward a newer erosion cycle has etched its way headward along the local sub-rectangular joint system, and divided the ancient surface by incision into a complex of potential-bornhardt compartments. Where the newer cycle is best developed, whole archipelagoes of mature bornhardts, lacking the summit bevel of the older cycle, provide as fine a field for study as can be desired.

The efficacy of the new cycle, inherent in Obst's pregnant remark, lies in the fact that rapid down-cutting may proceed along the joint systems and in other suitable directions. Without this, as will be demonstrated in the following section, bornhardt development cannot occur.

(5) *The margins of bornhardts are, almost without exception, independent of the petrological boundaries of the suitable rock types in which they occur.* Always the boundary of the adjacent plain transgresses on to the suitable type of rock. In a region comprising many hundreds of square miles of suitable rock types, bornhardts generally occupy only a small proportion of that area. Their margins are thus erosional features, and the general aspect of bornhardts is due above all to erosional agencies. Bornhardts are erosional forms.

In the past, when vertical lowering (peneplanation) was deemed to be the general mode of landscape evolution in Central and Southern Africa, no satisfactory account of the development of bornhardts was forthcoming; but the writer's recognition of pediplanation,[2] with its twin processes of scarp-retreat and pedimentation, as the almost universal mode of landscape evolution in that great territory provides a new approach to the bornhardt problem.[3]

After the incision of rejuvenating streams, the lateral scarps or valley walls, standing steeply in the hard, homogeneous rocks, retreat parallel to themselves, maintaining that steepness of flank for which bornhardts are notorious. Retreat is sometimes by spalling, when the base of the bornhardt slope is littered with debris (Plate 2), and sometimes by chemical weathering, when the finer dust is blown away and the coarser fragments descend by gravity (interrupted occasionally by ledges and crevices) to the foot of the bornhardt scarp. This detrital sand is then washed away. Occasionally the foot zone of the bornhardt is quite free of debris from above and passes abruptly into the rock floor of the surrounding pediment (Plate 3).

Retreat of the faces of a bornhardt leaves a surrounding pediment at the foot, stretching in most instances to the very banks of a nearby stream course. Pediments are to be found about the bases of nearly all African bornhardts.

[1] E. Obst, "Das abflusslose-Rumpfschollenland im nordöstlichen Deutsch-Ostafrika," *Mitt. Geogr. Gesell. Hamburg*, bd. xxxv, 1923.

[2] Lester C. King, "Landscape study in Southern Africa," *Proc. Geol. Soc. S.A.*, 50 (1948) xxiii–lii.

[3] See also W. M. Davis, "Rock floors in arid and in humid climates," *J. Geol.*, 38 (1930) 150–3; and Kirk Bryan, 'The Papago country, Arizona' (U.S. Geol. Surv. Water-Supply Paper, 499), pp. 89–97, Washington, 1925.

5. Two views in the Matopos, Southern Rhodesia, from 00 feet, showing successive stages in the bornhardt cycle

Photo. Aircraft Operating Co.

Indeed, it is among bornhardts that many of the finest pediments may be seen (Plate 5). In the writer's experience of some hundreds of bornhardts and bornhardt groups, not more than half a dozen were without the encompassing pediment, and for each of these exceptions special explanations were available. The approach up the pediment slope is soon recognized as one of the most characteristic incidents of bornhardt field-study in Central and Southern Africa. The slopes vary according to the stage of development of the bornhardt and pediment from about a $^1/_4$ degree to 7 degrees. Most are between a $^1/_2$ and 3 degrees, measured from the stream bank to the base of the bornhardt face.

The sharpness of angle often found between scarp and pediment, sometimes amounting to a nick into which a boot can be placed, has yet to be wholly explained. It is known to be a weathering phenomenon,[1] and Dr. A. L. du Toit has remarked to me that water can sometimes be obtained in shallow wells dug into rotted rock at the feet of bornhardts when a borehole on the same site, passing into deeper rock, is unsuccessful. Discussion of the process of pedimentation as such is beyond the scope of a paper on bornhardts, but we may note in passing that the sharp passage from pediment to bornhardt is not unique. Under semi-arid climates the junction of pediment and scarp is fairly generally abrupt, and where the country rocks "stand well," as is necessarily the case with bornhardts, the change is naturally striking (Plate 3).

The higher parts of pediment surfaces, near the foot of bornhardts, are occasionally of bare rock; but pediments are generally covered with a thin veneer of soil resting sometimes on fresh, sometimes on weathered, rock. Pediment profiles are always concave, except possibly on the rocky portions which do not constitute more than a very small fraction of the general pediment area. The flattish of gently domed "ruwares" of Southern Rhodesia do not represent worn-down remnants of former bornhardts; nor do they represent potential bornhardts, unless incision of neighbouring streams is likely to occur. Their history is often complicated, but in general they may be regarded as pediments.[2]

Water action is certainly dominant in producing the general concave profiles of pediments in bornhardt country, and I have occasionally seen from the air outwashes of sand produced by sheet or braided flow across such pediments. But near the bornhardt the problem is more difficult. Though considerable quantities of rain fall on a large bornhardt, little runs off in spite of the bare rock surfaces, most being held in cracks and crevices.

Many rocky pediment surfaces adjacent to bornhardts clearly owe their form more to general weathering than to the action of running water (like that of the "mushroom rock" seen in Plate 6), and the presence of "inverted pediments" under many blocks and boulders where a horizontal joint earlier passed through the parent rock mass is a plain indication that rock weathering, and not the action of moving water, is the chief agent of pediment extension.

Cotton,[3] following Thornbecke, has expressed the view that bornhardts

[1] Cf. Kirk Bryan, "Processes of formation of pediments at Granite Gap, New Mexico," *Zeit für Geomorphologie*, 9 (1936) 134.

[2] W. M. Davis, "Granite domes of the Mohave Desert, California," *San Diego Soc. Nat. Hist., Trans.*, 7 (1933) 211–58.

[3] C. A. Cotton, 'Climatic accidents in landscape making,' p. 95, Christchurch, 1942.

6. Mushroom rock at foot of Domboshawa mountain, Southern Rhodesia

7. Residual boulders on summit of bornhardt. Cecil Rhodes' grave in the Matopos

developed in a savanna rather than a semi-arid cycle are formed by the lateral migration of streams against the foot of granite masses. However, I have found almost invariably in Africa that a small pediment, even if only a few feet in width, separates streams and rivers from bornhardts, so that I believe this regimen exists under savanna conditions too.

The bornhardt cycle is a cycle of pediplanation, and all stages in this landscape cycle may be found in Southern Africa from extreme youth to extreme old age. The stage of youth is characterized by incision of the local streams, dividing up the country into a number of incipient bornhardts. As the valleys deepen, broadening pediments appear laterally to the streams, and scarp retreat commences on the faces of the bornhardts. At this stage a jumble of bornhardts and castle koppies occupies most of the landscape. The hills are spaced according to the distances between the stream channels, which in turn are possibly governed by the spacing of the rectangular joint system of the rocks. The Matopos of Rhodesia exhibit this stage to perfection (Plates 4 and 5).

At maturity many of the bornhardts have disappeared under erosion, pediments have coalesced, and a wide pediplain is forming. The remaining bornhardts are often, in their semi-isolation, very striking features of the landscape. As their summits have possibly not been lowered much below the level of the former summit plain, they may tower 1500 feet or more above the surrounding pediplain, as does Bari, a 1500-foot bornhardt in the Chiweshe Native Reserve (Plate 2). Some of the Matopo bornhardts, for example, still bear the bevel of the earlier Rhodesian summit plain. In regions where the sub-rectangular joint system is more powerfully developed, the smooth, curved outlines of the typical bornhardt are absent and castle koppies appear instead. They are normally less imposing.

In extreme old age, the towering bornhardts are reduced to piles of rock rubble. Even in full development they often bear residual boulders on the summit (Plate 7). Around them extends the ever encroaching, multi-concave pediplain; and so the scene remains with little variation until fresh rejuvenation produces a new crop of bornhardts, to run through the same cycle in their turn.

THE PRESERVATION OF THE NEW FOREST: THE HISTORICAL BACKGROUND

REPORT OF THE NEW FOREST COMMITTEE, 1947. (Cmd. 7245.) *London: H.M. Stationery Office*, 1942. $9\frac{1}{2} \times 6$ *inches; 104 pages; maps in end pocket.* 3*s* 6*d*

THE NEW FOREST is one of the most individual areas in England, with a fascination that is peculiarly its own. It also provides a good illustration of the theme that our landscape to-day cannot be appreciated without some knowledge of its past. The scenery of the New Forest, no less than its economy, is

bound up with some of the most distinctive chapters in our history, and anyone who attempts to plan its future is at once faced with a most intricate array of legal complications that are a heritage from the past. Many abortive Bills have failed to deal with the Forest, and a succession of Acts of Parliament, Enquiries, Committees and Commissions has attempted to resolve the conflicting interests that its existence implies. At one time, as we shall see, there was even a proposal for what amounted to abolishing it. This would have meant an inestimable loss, and yet if the Forest is to survive it must somehow be fitted to the modern developments that are inevitable. It was to consider this problem that a Committee was appointed in April 1946 under the chairmanship of the Right Honorable H. T. Baker. Its terms of reference were: "To investigate the state and condition of the New Forest and, having due regard to existing rights and interests, to recommend such measures as they consider desirable and necessary for adjusting the Forest to modern requirements." The Committee presented its report in November 1947.

The first thing that must be said is that "forest" is neither a botanical nor a geographical term but a legal one. The origin of the word has been disputed, but one view is that it implied an area outside (*foris*) the common law and subject to a special law that safeguarded the king's hunting. A love of the chase was one of the outstanding characteristics of the Norman kings, and the Conquest was followed by a rapid and violent extension of forest land in England. The making of the New Forest by William the Conqueror was an event that produced a great impression both on his contemporaries and on their successors. The amount of destruction it involved has long been a matter for controversy. Writers of the twelfth century declared that a flourishing district had been reduced to a waste by the wholesale destruction of villages and churches. The death of William Rufus in the Forest was said to be a judgment from heaven because his father had driven so many people from their homes. Some modern historians have developed this theme of destruction, and Freeman's 'History of the Norman Conquest' made much of it. This idea is still abroad, and more than one witness who appeared before the Committee believed it to be true. Many local historians however never accepted the view. They pointed to the poverty of the soil, for the hungry sands and gravels that cover most of the area hardly support the idea of former prosperity. They pointed also to the Domesday evidence which again does not show this to have been a flourishing region. It is true that many Domesday holdings are said to be "now in the forest," but by distinguishing between those villages wholly afforested and those only partially afforested, the late F. H. Baring showed in 1901 what probably happened. Roughly speaking, William found about 75,000 acres of waste land, and he enlarged this by taking in some twenty villages and a dozen hamlets amounting to between 20,000 and 25,000 acres. This constituted the Forest proper. Around this, portions of other villages were taken in to protect the deer; these additions were probably of the order of 10,000 to 20,000 acres.

During the two centuries that followed, the margin of the Forest shrank as concessions were forced from the medieval kings. A perambulation of 1301 shows that the outer limits of the Forest were very much as they are to-day. But within this area some land has passed into private ownership, partly as a result of grants to monasteries and to individuals, and partly as a result of squatting which has been vividly described by Dr. Kenchington in his recent study of 'The commoner's New Forest' (1944). At the present day the perimeter of the Forest includes some 92,000 acres, of which nearly 28,000 acres are in private hands. Not only has the Forest survived but also much of its medieval custom. Of all the forests in England, it is the only one that still

retains its Court of Swainmote to deal with offences against its laws and customs. The officials of the Forest are still known as Verderers and Agisters, and the medieval doctrine of levancy and couchancy is still important.

But this simple account does less than justice to the complications which the past has bequeathed to the present. Put briefly, the problem of the Forest lies in the conflict of interests that has developed between the inhabitants and the Crown. The inhabitants in and around the Forest hold from time immemorial a variety of common rights—the right of turning out ponies, horses, cattle, donkeys, chickens and geese; pigs may also be turned out during the autumn, and sheep in special cases. Other common rights include those of cutting turf, obtaining fuel and digging for marl. Some of these rights have fallen into desuetude, but many are still important. The total number of commoners in 1944 was estimated at 2004: "Their numbers vary because a man may at any time subdivide his holding or amalgamate it with others" (p. 46). The land is not theirs: it is, of course, Crown property, but the Commoners have a right "to what they can take from it through the mouths of their animals" (p. 35) and their common rights form an important source of income. Holders of land are therefore able to keep many more cattle than can be maintained solely on their own holdings.

On the other hand stand the interests of the Crown. It is true that its concern in the game laws of the Forest had long ceased to be important by the nineteenth century. The Deer Removal Act of 1851 provided for the removal of the remaining deer—some 3000 in all—and this was accomplished as far as was practicable. But in the meantime a new and important Crown interest had been developing. From the seventeenth century until the middle of the nineteenth the Forest provided a valuable supply of naval timber. Powers were obtained to plant timber provided that the plantations were thrown open again as soon as the trees were past being damaged by animals. The management of the Forest was invested in the Commissioners of Woods and Forests, whose interest naturally was in the Forest as a producer of wood and not as a provider of pasture. A conflict with the commoners was inevitable, and a Select Committee of 1868 recommended that the problem of common rights should be settled by dividing the Forest into two: some parts were to be freed from Common Rights and allotted to the Crown, and the rest was to be given to the commoners to deal with as they thought best. As the present report says, it "was a confession of total failure" (p. 10).

In the meantime, however, a new and powerful movement had been growing up in favour of preserving the Forest as a place of recreation and enjoyment and, in particular, of maintaining the general character of its scenery. William Gilpin, whose writings did so much to promote the appreciation of the so-called "picturesque," held the living of Boldre in the south of the Forest from 1777 to 1804. His 'Remarks on forest scenery' was first published in 1791 and did much to make known the beauty of the area. Among subsequent accounts must be mentioned the classic 'The New Forest: its history and its scenery' by J. R. Wise, first published in 1863. Much of the scenic charm conveyed by these and other writers was due to the fact that the Forest was far from being all woodland. To-day the open heathland amounts to about one half the total area; and besides this there are patches of grass known as "lawns" together with wide tracks and glades that provide ample vistas. It is interesting to note that these areas of grass, which form such an important element in the scenery of the Forest, are maintained by the animals of the commoners. Without grazing, these open areas would soon be covered by thorn and other bushes. One consequence of the Deer Removal Act was an alarming spread of scrub

over the lawns. A local proverb says: "The deer start the work, the ponies follow it up, and the cattle finish it." This is sometimes forgotten by motoring tourists who advocate restrictions on the movement of ponies. As Dr. Kenchington in his recent book has said: "It was this old balance between livestock and vegetation which had given the Forest scenery its peculiar character, its unique charm and beauty" (p. 126).

The Scots pine seems to have been first planted in the Forest about the middle of the eighteenth century; and a century or so later, many people were afraid that the activities of the Commissioners for Woods and Forests would replace the existing scenery of the Forest by monotonous and artificial-looking plantations of conifers. The growing movement for the preservation of the scenery of the Forest found expression in an Act of 1877 which not only restricted the powers of the Crown and strengthened the rights of the commoners, but safeguarded the prevailing landscape. It was the first statutory recognition of amenity in the Forest, and it declared that care should be taken "to maintain the picturesque character of the ground," and to preserve "the ancient ornamental woods and trees in the Forest."

The attempt to establish a *modus vivendi* within the terms of the Act turned out to be long-drawn and productive of many controversies. The war of 1914–18 and its aftermath accentuated the difficulties of the time; both the felling of timber for the war effort, and the associated planting, were carried out without regard to amenities. In 1923 the control of the Forest was transferred to the newly instituted Forestry Commission. "The new authority," write the authors of the present report, "took charge under the worst possible conditions. The protection of Inclosures was far from complete and Commoners' animals were roaming at large in nearly all of them. The Commoners who had been getting good prices for their animals and had heavily increased their stock, resisted any effort to exclude them from the Inclosures. In the meantime criticism of the forestry work on aesthetic grounds was becoming active and widespread. The official policy tended more and more to regard the Forest solely from a silvicultural point of view, and plans were made for the wholesale replacement of broadleaved species by conifers. There were numerous letters to the London and the local press, many questions in Parliament, and hostile meetings in the Forest itself" (p. 13). These fears were allayed in 1928 by an official declaration "that the proper interpretation of the Act of 1877 was that the amenity of the New Forest was the chief object of management and that considerations of profit should take a second place. . . . This was the beginning of more friendly relations between the Forestry Commission and the Verderers which were to develop as the years went by" (pp. 13–14).

The war of 1939–45 inevitably has meant encroachments upon the Forest. They amount to about 8000 acres, and they involve bombing ranges, aerodromes, and camps of various kinds, besides such things as trenches, sawmills and barbed-wire entanglements. The Committee was gravely concerned by the tendency to regard the disfigurement as of no great importance and, what is more, to treat as a precedent the breach of the Forest laws which these encroachments entail. Quite obviously the present time is ripe for reviewing the position of the Forest as a national heritage.

The detailed recommendations, occupying over seven pages of the Report, cover the main problems that, as we have seen, result from the history of the Forest. In the first place, the rights of the commoners must be protected. The Court of Verderers should be reconstituted and made more representative by securing the representation of various interests and by reducing the qualification for Verderer from a holding of 75 acres to a holding of 1 acre; the ballot

for the election of Verderers should be secret and not open. The powers of the Verderers should be such as to enable them to control the grazing and the administration connected with it. In the second place, the Forestry Commission must be allowed to conduct its operations as efficiently as possible but with due regard to their effect upon the landscape. And in the third place, the general amenities of the Forest must be protected. This means regulations about such matters as golf courses, camping facilities, gypsies, military training areas, landing grounds for aeroplanes, advertisements and highway planning. It means also the declaration of the Forest as a Nature Reserve, with full protection for its unique flora and fauna and with adequate facilities for their study by botanists, entomologists, ornithologists and others. Only those with a most intimate knowledge of the Forest are competent to discuss the merits or demerits of this or that particular recommendation. Taken as a whole however they cannot fail to win the support of all lovers of the English countryside.

H. C. DARBY

THE SOCIAL DEVELOPMENT OF MODERN EGYPT

EGYPT: an economic and social analysis. By CHARLES ISSAWI. (Issued under the auspices of the Royal Institute of International Affairs.) *London: Oxford University Press*, 1947. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* xvi+219 *pages.* 15*s*

MR. CHARLES ISSAWI, Adjunct Professor of Political Science at the American University of Beirut, has written a thoroughly reliable account of the economic and financial structure of Egypt. He is familiar with the vast literature on the subject, including books and documents in Arabic, and there is evidence of personal observation of the Egyptian scene. The historical background and recent political trends are briefly and lucidly described, and there is a short review of education, literature and the press. Post-war developments receive only passing notice, yet the economic chapters, with their wealth of statistics, are of permanent value because the basic features of the national economy remain much as they were before the war.

The facts are set out soberly, and the book is clearly not intended as an indictment of Egyptian society. The conclusion however emerges that the façade of material progress and outward prosperity hides a thoroughly unhealthy state of social maladjustment. A high death-rate has not checked the spectacular growth of the population from some nine and a half millions in 1897 to nearly sixteen millions in 1937. The cultivated area has not increased in the last twenty-five years, though the heightening of the Aswan Dam and the construction of the Gebel Awliya Dam have added considerably to the water supply and rendered possible a programme of agricultural expansion which was planned to be completed in 1953. The great wealth produced by the most fertile soil in the world is reflected in the ostentatious luxury of the privileged few, while the mass of the population is living on the verge of starvation. The pitiful conditions of life in the villages have been exposed by many writers, and Mr. Issawi's unemotional array of facts and figures is possibly more eloquent than denunciation. Of the large landowners, who wield all political power, he writes that they display "all the defects of a privileged class unredeemed by the virtues

of a ruling class." Industrialization has produced an urban proletariat of some 700,000 workers whose lot is as deplorable as that of the fellahin. "The terrible overcrowding and promiscuity in which the bulk of the Cairene and Alexandrine populations live make European slums seem almost palatial in comparison." Under the iniquitous corn laws the town workers pay a yearly subsidy of some five million pounds to the agricultural interests, and the efficiency of industrial labour is much impaired by undernourishment and the prevalence of disease. Unrepresented in Parliament and faced with an indifferent or hostile public opinion, labour has not been able to do much to improve its lot, yet "unless the government shows much more wisdom than in the past in its dealings with the working class there is great danger of this struggle taking a violent form." The discontent of the fellahin, like that of the urban workers, lacks organization and leadership; it cannot moreover be ventilated in a parliament, the members of which, divided on personal issues and engaged in keen rivalry for power, represent no divergent social interests. There is a wide franchise but in the country the electors' choice is in effect restricted to the two or three influential landlords of the district. Only 20 per cent. of the population are literate and the aggregate circulation of the Arabic daily papers is less than 200,000. The budget of the Ministry of Education has risen from £E 525,000 in 1914 to £E 4,438,000 in 1939, and the number of pupils and students in government institutions of all grades from 15,000 to 232,000; yet "it may fairly be said that Egyptian educationists have been no more successful than their British predecessors in providing either a highly educated class or a tolerably educated mass." Nevertheless the spread of education has produced a class of intellectuals whose economic and social prospects fall seriously short of their legitimate ambitions. In 1937 it was estimated that 7500 holders of the Baccalaureat and 3500 graduates of the University or the Higher Schools were unemployed. The intellectuals have always played an active part in Egyptian politics and most of them belong to the unprivileged or underprivileged class. Politically conscious to an acute degree, they have hitherto been the supporters of fanatical nationalism and xenophobia, but the fulfilment of national aspirations has brought disillusionment and frustration and they are beginning to realize that their woes are not due to British rule and the competition of the foreigner. It is amongst this class that a social conscience is developing and that the demand for economic and social reform finds its most vocal expression. According to Mr. Issawi, "the failure of successive governments to tackle the urgent social and economic problems has disgusted the youth of the towns with the present political order and aroused a keen desire for change"; and, in a passage written in 1945, he alludes to "a very marked spread of socialist sentiment among the petty bourgeoisie and intelligentsia." It should be noted that the socialism he has in mind is not that of a democratic labour movement, and it is not surprising that Egypt is considered by many observers to be a promising field for Russian-inspired influences. Disappointed intellectuals are the natural leaders in a class struggle against landlordism and the abuses of capitalism.

The conclusions to be drawn from Mr. Issawi's book are disheartening for all friends of Egypt and her people, but careful analysis of her disease is necessary before the appropriate cure can be applied, and to this end Mr. Issawi has made an important contribution.

S. HILLELSON

REVIEWS

EUROPE

LEICESTERSHIRE MAPS: a brief survey. By BASIL L. GIMSON and PERCY RUSSELL. *Leicester: Edgar Backus*, 1947. $8\frac{1}{2} \times 6\frac{1}{2}$ *inches;* viii+40 *pages; maps.* 7*s* 6*d*

This little book deals with forty-four maps and plans of the county and city of Leicester, most of them engraved between 1576 and 1901. In brief but useful notes the authors describe successive improvements in cartographical technique as applied to Leicestershire, while at the same time they trace the changes wrought in the face of their county by industries and new methods of transport. They consider, with much reason, that Saxton and all good early map-makers must have drawn largely upon the records in the offices of the county sheriffs; they put Speed in his place as an historian, not a cartographer; they have done justice to W. King's valuable map of the country surrounding Belvoir Castle (1806); and they have emphasized the importance, often overlooked, of the well-known group of anonymous county maps of 1601–02, without however deciding whether Jodocus Hondius or Hans Woutneel was behind that venture. Probably both were.

The claims which the authors have made for some maps are not however justified. Morden's 'Leicestershire' of 1695 was not the first engraved county map either to show roads or to mark the prime meridian as passing through St. Paul's, London; Senex's road-atlas of 1719 was not the earliest work to present Ogilby's 'Britannia' in a brief, handy form; and Smith's 'Leicestershire' of 1801 was by no means the first county map to adopt the prime meridian of Greenwich. As for Saxton's name on his maps, that was inserted on the proofs after the Queen granted him a "privilege" in 1577. Nevertheless this book is authoritative in the main and proves that its authors are well qualified to follow the admirable example set by Dr. Whitaker and to prepare a full bibliography of Leicestershire maps. The printing, illustrations and cover are exceptionally good for the price. E. L.

THE BRITISH FUEL AND POWER INDUSTRIES: a report by P.E.P. *London: Political and Economic Planning*, 1947. $9\frac{1}{2} \times 7\frac{1}{2}$ *inches;* xi+406 *pages.* 30*s*

The development of the fuel and power industries can be regarded almost as an index of industrial prosperity. Their uncertain position, at least since the time of the first world war, is a measure and in part a cause of Great Britain's weakened position. This volume examines in detail the present condition of these industries. It is well balanced and objective. There are omissions, but these are readily excusable when so much is given in so short a space. The study is admirably documented and contains a collection of statistics of production and utilization of fuels unequalled in range and usefulness.

The sources of industrial and domestic power are reviewed. About 90 per cent. of the power consumed in Great Britain is derived from the combustion of coal or of coal derivatives. The remainder is obtained from oil, either imported or from wells and factories in Great Britain, and from water power. The authors refer to the development of power from the sun, the wind and the tides. The limitations to the use of atomic power and to the further development of hydro-electric power are stressed. It is this section of the book however which the

geographer finds least adequate. There is all too little on the distribution of coalfields, and on the depth, thickness and quality of the seams, and the influence of geographical and geological factors on the conditions of working are ignored. Nevertheless the authors stress the fact, so often forgotten, that coal is in reality a number of distinct though related substances with differing costs of production and modes of utilization. The degree of replacement of one variety by another and the joint production of two or more raise problems of the greatest importance to the industry.

The decline in output of coal, both in the aggregate and in relation to total employment, is examined. Technical considerations alone cannot explain the falling off, but the question of morale in the industry is barely touched. Labour conditions and wage rates are examined in considerable detail.

The generation and distribution of electricity and the manufacture of gas, the relative efficiency of differing methods of fuel consumption, improvements in boiler technique, the utilization of waste heat, and the best types of factory lay-out in the interest of fuel efficiency all receive extended treatment.

To say that this book has come at an opportune moment would be to underestimate its value. It is a response to the present serious situation and as able an analysis as one could wish for. It does not pretend to make recommendations or to suggest remedies. It sets out the factual data in the light of which fuel policy should be framed. For the more limited purposes of the geographer, it provides analytical methods whereby he will the more satisfactorily explain his distributional patterns. N. J. G. P.

MY CAVES. By NORBERT CASTERET. Translated by R. L. G. Irving. *London: J. M. Dent*, 1947. $8\frac{1}{2} \times 5$ *inches;* xii+172 *pages; illustrations.* 15*s*

'My caves' is a sequel to 'Ten years under the earth,' the English translation of M. Casteret's 'Dix ans sous terre' and 'Au fond des Gouffres,' which was published in England in the closing months of 1939 (reviewed *Geogr. J.* 94 (1939) 495). Since that time much has happened in France; and it is therefore with real pleasure that British speleologists will learn that all is again well in caving circles in the south of France and the Pyrenees. M. Casteret's story of this sporting science of alpinism inverted is a lively one, spiced with adventures underground and owing much of its charm to an excellent series of cavern photographs. The book is also an authoritative record, rich in observation. But then M. Casteret is an expert who, in the last thirty years, has visited more than seven hundred caves and potholes, chiefly in the Causse country of the south of France and the lesser known limestone hills of the Pyrenees. He can also claim many "firsts" for he has led the way down (or into) scores of them.

'My caves' describes briefly the exploration of the underground river Labouiche in the Pyrenees; tells of some pothole descents in the Basque provinces; and in the last chapter gives an interesting account of three years' study of cave bats. "Everywhere and with increasing frequency," M. Casteret writes, "fresh discoveries are rewarding those who have faced the unpleasant and often thankless task of worming their way into apertures which have often been passed by and considered impracticable." The author and his friends in the Société Spéléologique de France have certainly proved the truth of this for they have added miles to the known length of French caverns and hundreds of feet to the explored depths of potholes. In England too potholers have had their successes in recent years, particularly in north-west Yorkshire, but the limestone of our hills has yet to yield caverns to equal the Aven d'Orgnac, the underground river Bramabiau in Gard, or the long tunnel-like cave of Miremont in Dordogne.

Mr. Irving is to be congratulated on his efficient translation, although perhaps

his rendering of "chatière" as "cat-run" is less adequate than the Yorkshire cave term "rat-hole." He has had the help in revision of Mr. E. E. Roberts, one of the best known British potholers. M. Casteret gives twenty-six illustrations in photogravure, and there is an adequate index but no sketch-map.

A. M.

NORWAY IN MAPS. Vol. A, text; Vol. B, sketch-maps and photographs; Vol. C, maps. By TORE SUND and AXEL SØMME. *Bergen: A. S. John Grieg's Boktrykkeri*, 1947. 10×7½ *inches;* 96+52 *pages*

This is the first of a series of four publications by the Commercial High School at Bergen. It consists of a number of map studies with a volume of illustrative photographs and sketch-maps. As the authors hope, the selection of characteristic regions of Norway will be useful in the preparation of lectures and study tours, and it will in addition serve as a thorough introduction to Norwegian topographical maps.

The maps chosen include examples of all types of Norwegian landscape—mountain and lowland, inland and coastal. Industrial regions are adequately covered, although more attention is naturally paid to farming, fishing and forestry. The studies of Jaeren, a densely peopled coastal lowland, and Stor Elvedal, an eastern forested region, are of great interest to the human geographer. The selection includes several districts of the eastern lowlands, examples of coastal areas from Kristiansand to Finnmark, and others more remote from maritime influences. No aspect of physical or human geography is neglected and particular emphasis is laid on the effect of soils, especially marine clays, upon the distribution of settlements. Welcome features are tables of conventional signs and of geographical terms with English equivalents, the translation or explanation of Norwegian words where they occur in the text, and cartographic descriptions of the maps in the collection.

The production is not of the same quality as the subject matter. A number of misspellings and misused words could have been eliminated, and the photographs, while usually well chosen from the geographical point of view, do not reach the high standard typical of recent Norwegian publications. But minor drawbacks such as these cannot detract from the importance of this work, which will be of value and interest to all students of the geography of Norway. K. B.

A HISTORICAL AND POLITICAL GEOGRAPHY OF EUROPE. By N. J. G. POUNDS. *London: George Harrap*, 1947. 8×5½ *inches;* 540 *pages; maps.* 25*s*

The content of historical geography has long been a subject of controversy. Dr. Pounds does not attempt to define either historical or political geography. He does however set out clearly his purpose, which is "to trace the influence of essentially geographical factors—the surface topography of the earth—on, first, the course of European History and then on the intricacies of world politics." This is a task of no mean order and one which would be more easily accomplished in a work of several volumes than in a single text. Originally conceived as "a textbook for sixth forms and for those preparing for the Higher School Certificate examination"—indeed, the varying emphasis reflects the requirements of a university syllabus—it has been extended to attract the general reader as well. The book has not the brilliance that the publishers claim for it; although comprehensive, it is uninspiring.

The body of the text is divided into four parts: ancient and medieval times (108 pp.); modern times (84 pp.); the contemporary scene (163 pp.); and extra-European relations (133 pp.). There is a brief introduction which takes

the form of a summary of the geological history, the relief and climate of the continent of Europe, and an equally brief conclusion in which the author discusses geopolitics, geographical determinism and the concept of the State. The main defects of the book are due to the wide range not only of time but also of space which Dr. Pounds surveys. He has attempted far more than his title suggests although not more than he avows in his preface. He moves from Neolithic times to "the contemporary scene," surveying also the whole field of nineteenth- and twentieth-century imperialism. The United States, Latin America, Africa, China, Japan, India and Australia are all embraced; Antarctica alone is excluded. Such a sweep has prevented him from dealing in full with any one topic.

In his preface Dr. Pounds decries the half truths that often masquerade as Geography; but one would question certain of his own statements. Is it true to say of writers who have forecast the rise and decline of States that "in general they appeal to the biological conception of conflict and the survival of the fittest" (p. 519)? Again, while it is true that we cannot test historical laws by controlled experiment, it is not proven that such laws cannot be formulated; the Hegelians, the Marxists, Spengler, Toynbee and others have claimed the discovery of such laws.

Dr. Pounds is a geographer and therefore we expect his text to be fully illustrated by maps. Not once however does he direct his reader's attention to a map by a word in the text. As so frequently happens, the maps are but pictures; they do not serve as documents contributing evidence of first importance. Although carefully drawn and lettered they are disappointing from a geographer of Dr. Pounds' standing. Political geography pivots upon position on the globe, but only one map (Fig. 122) bears a parallel of latitude. Some indication of the graticule is essential when the map is drawn on a projection which distorts north–south as well as east–west relations; Figs. 99 and 141 are outstanding examples of this deficiency. Several of the maps (Figs. 8, 9, 13, 14, 21 and 22) are probably not worth including, since Dr. Pounds himself (p. 22) stresses the need for reference to both a good physical and an historical atlas, and these maps show nothing that is not found in even the most elementary historical atlas. In general the maps are unfinished; the omission of the positions of important towns (Ancona and Genoa from Fig. 34, Novgorod and Pskov from Fig. 54, Schneidemühl from Fig. 104, etc.) and of an explanation of the symbols employed (Figs. 90, 104, etc.) would suggest that the maps were neither designed as an integral part of the text nor carefully vetted.

Dr. Pounds is to be congratulated on his detailed references, which will be a boon to the student although there are several notable omissions; among these are 'An historical geography of England and Wales' edited by H. C. Darby, W. K. Hancock's 'Survey of British Commonwealth affairs' and A. Toynbee's 'A study of history' (abridged version). Though the book is disappointing in view of Dr. Pounds' earlier contributions to his subject, it should be on the shelves of every student reading for a first degree in geography. E. M. J. C.

ASIA

MOUNT EVEREST 1938. By H. W. TILMAN. *Cambridge: University Press*, 1948. 9×5½ *inches;* 160 *pages; maps and illustrations.* 15*s*

Mr. H. W. Tilman's personal account of the 1938 Mount Everest Expedition will be read with interest and amusement especially by his companions of the expedition, for he humorously and admirably conjures up those little pictures of expedition life which are too often omitted from more ponderous official

accounts. In this manner the reader is carried airily along the march across Tibet and equally airily, despite the lack of oxygen, up Mount Everest to 27,400 feet.

Mr. Tilman is a leader of strong opinions. He is the advocate of the small, simple and economic expedition to Mount Everest. He has no use for science and scientists and considers them and their works redundant. Doctors, he maintains, are also unnecessary, and he makes a strong case for the exclusion of everyone who is not a climber from an Everest expedition, believing that only with an organization untrammelled by science, medicine, transport officers and wireless officers can the summit be reached. He believes that Everest can be climbed by a party living on simple and unvaried food with the minimum of clothing and personal equipment, and that the man who, like the reviewer, takes a hot water-bottle in order to keep his feet warm at nights and so enjoy a sound sleep is beyond the pale.

He also believes in the Abominable Snow Man, and in support of this mythical creature contributes a long and witty appendix which skates so lightly over the scientific facts (the tracks have been proved to be made by a bear) that the reader is left half convinced and half hoping that there is indeed a Snowman who spends his time hiking across the snows of the Himalaya when he is not at lower levels gobbling men and yaks.

With some of Mr. Tilman's doctrines one can agree but with others one cannot so easily. The small expedition is the best for all Himalayan travelling and mountaineering up to peaks of about 25,000 feet in height, but above that on the greater peaks new factors are operative, such as the length of the route and the need for numerous camps as well as supports and reserves, especially having regard to the fact that once a man has been high on Everest he has shot his bolt physically and is unlikely to have the strength to return for another attempt. Those who attempt the summit of Everest must do so with the knowledge that their retreat is covered by well-stocked camps and the support of their companions, otherwise they may well suffer the fate of the Germans who died on Nanga Parbat. And I have not yet been on an Everest expedition when a doctor did not perform the most useful and at times vital work.

As to science, it may well be that sufficient has been done on the mountain to justify future expeditions being solely concerned with reaching the summit, but the work already achieved in topography, geology, physiology, botany and zoology has of itself made the fight for Everest worthwhile. The traveller must ask himself whether any expedition to a remote part of the world is not the better for having aims beyond the mere reaching of the objective.

Mr. Tilman has written a most readable book and as one of his companions I have spent a fascinating evening travelling over the golden plateaux of Tibet towards a great objective. Two of the photographs are wrongly titled: that facing page 77 should read Peter Oliver; that facing page 100 is not Khartaphu but one of the summits of Lingtren near the head of the Rongbuk glacier.

F. S. S.

COLONIAL POLICY AND PRACTICE: a comparative study of Burma and Netherlands India. By J. S. FURNIVALL. (Issued in cooperation with the International Secretariat of Pacific Relations.) *Cambridge: University Press*, 1948. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* xiv+568 *pages; map.* 36*s*

This book is less a study of Burma or Netherlands India than an analysis of colonial policy in general and of its effects. The history of Burma under British rule is the subject of four of the thirteen chapters and another chapter deals similarly with Java. The treatment is to distinguish periods of Liberalism,

Economic Efficiency and Political Democracy and to trace in each period the social consequences of administrative practice. There is an over-simplification in the implied definiteness of colonial policy in its successive phases and perhaps in the attribution of some of its effects, but it serves to bring out the author's thesis, the recurrent theme of the book, that the outcome of colonial rule has been a universal trend towards the disruption of self-ruling societies and their subservience to an alien economy.

The incentive to colonial expansion has been economic but the treatment of native peoples has also reflected the philosophy of the colonizing power. Mr. Furnivall quotes the claim of the Portuguese: "I do not pretend that our sole aim was to preach, if others will allow it was not only to trade." After the Industrial Revolution Britain sought markets, and as Liberals we strove to substitute economic freedom and the rule of law for the bonds of native custom. The Dutch, more interested in tropical produce, respected the authority of vassal chiefs and village custom. Later, our interest in increasing the efficiency of native labour coincided with the wish to extend to subject people the benefits of hygiene and education. But economic freedom and the rule of law led to indebtedness and dispossession, while the exaction of produce and labour from vassals led to impoverishment and bankruptcy. Unfamiliar social legislation, and even the creation of local bodies to administer it, extended the decay of custom and usage from the economic to the social sphere. More recently, representative legislatures on a western model have fostered, not self rule, but the further disintegration of communities without a common constructive purpose.

In general our contact with primitive peoples, the inevitable consequence of geographical discovery and technical progress, is a clash between incompatible ways of life; the reshaping of primitive ways has destroyed autonomous societies, and without self-rule there can be no progress towards democracy and independence. This is Mr. Furnivall's analysis of colonial history in eastern Asia and he foresees the same development in Africa. The lesson drawn from the analysis is that the rate of change towards compatibility with the outside world must be kept within the capacity of the native society to rule itself. Indirect rule is therefore to be preferred though the sanctions underlying personal authority are themselves in danger; rapid economic development renders them obsolete and the employment of chiefs to implement elaborate measures for social welfare reduces them to mere officials in the eyes of their people. Nationalism is to be encouraged, as tending to increase the capacity for self-rule, and the restraints imposed by the colonial power, which may not commend themselves to nationalists, should carry the approval of a disinterested international body —if such a body could now be found.

Mr. Furnivall's manuscript was completed in 1945 as a contribution to the post-war reconstruction of Burma; he is now Economic Adviser to a Burma no longer within the field of colonial policy and practice. The outcome in Netherlands India is still uncertain. But the argument of the book is equally relevant to the present development of tropical Africa and perhaps, even nearer home, to the impact of a new Planned Economy on the institutions of an old and complex society. F. G.

A PHYSICIAN AT THE COURT OF SIAM. By MALCOLM SMITH. *London: Country Life*, 1947. 9×6 *inches; 164 pages; illustrations.* 15*s*

A few years ago the reconstructed story of an English governess at the Court of Siam, followed by the excellent film version of the same, gave to the public a complete insight into the elaborately organized system that for very many

generations constituted the private harem life of the kings of Siam. Eighty years ago the English governess saw the system at its full development, and some forty years later Dr. Malcolm Smith, Physician to the Siamese Court and the author of this book, watched the last phases of the great zenana and its final collapse and disintegration on the death of King Chulalongkorn in 1910.

When the harem broke up, the First Queen, Saowapa Pongsi, mother of the new king, retired with a modest household to one of the lesser royal palaces and it was there that, as the doctor attended her through the illness that then overtook her, there developed the singular, close and lasting friendship between the reserved, imperturbable Englishman and the garrulous, capricious, gradually failing oriental queen that provides the essential motive for this unconventional book and makes its chief attraction.

The book contains seven chapters, the first consisting of a sketch of Mongkut, father of both Saowapa and her husband Chulalongkorn; terse, concise and comprising within its fifty pages about the best presentation of the life and conduct of that monarch that has appeared in English. The second chapter, though headed "Princess Saowapa," is concerned chiefly with the architecture, interior arrangement and administration of the Grand Palace at Bangkok including the harem, with digressions on midwifery, royal taboo and, strangely enough, the execution of criminals, little more than one page being given to the young princess. In chapter three, "Queen Saowapa," there is however more of the lady and much highly interesting detail concerning life in and about the royal harem. But here also the author digresses, in order, apparently, to convey information of a more general character for which he might not otherwise find opportunity. Such information is mainly accurate though here and there a slip occurs, as, for instance, where (p. 86) an erroneous impression is created as to the disposal of the public revenues, and where (p. 91) the founding of Singapore is antedated by some seventy years. Also the author seems to have forgotten (p. 194) that from an early date boys were sent to schools and colleges of republican U.S.A. without fear of political contamination.

In the fourth chapter the author devotes himself entirely to his royal patient —Queen Mother as she then came to be called—describing her home, entourage, manners, eccentricities and opinions, and recording all-night discussions, wise and otherwise, relieved by flashes of a natural intelligence, untrained but shrewd and largely exempt from the trammels of occidental propriety. The faithful doctor must join in protracted midnight meals, with ready sympathy for all sorts of troubles, mostly family, retailed with much sighing and sobbing. As thus: her eldest son the king, a misogynist (appalling thought!), her second an obstinate monogamist (almost as bad!), and the others generally unsatisfactory; surely here are matters to distract a still ambitious mother! He must know how to banish painful thoughts and turn the lady from tears to laughter (indeed usually no great difficulty), and be always prepared with medical advice, eagerly besought but often disregarded. And so this unique association continued for five years, at the end of which time, when the Queen Mother died, there was very little concerning the Siamese Royal Family that the author did not know.

The rest of the book is in the nature of aftermath. Remarks on the practical extinction of the Queen Mother's branch of the royal family; theories anent polygamy and the results of inbreeding in Siam and elsewhere; a study of the hocus-pocus that passes for Siamese medicine; and a short epitome of events in Siam subsequent to the author's departure therefrom; all are of much interest but subsidiary to the main story. The book is instructive, amusing, passably well written, excellently illustrated and of good presentation. W. A. G.

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AFRICA

IN THE FORESTS OF THE NIGHT. By JAMES RIDDELL. *London: Robert Hale*, 1948. 9½×6 *inches;* vii+228 *pages; sketch-maps and illustrations.* 15*s*

This is an interesting and often entertaining account of a photographic expedition to the Belgian Congo, which included an ascent of Mount Mikeno, illustrated with over a hundred self-portraits made by African game who broke the trip threads of the thirty Leica cameras employed. The author disarms technical criticism of these pictures—nearly all of which were made at night—by describing in detail the difficulties he and his companion amateur photographer encountered as they worked out techniques in the jungle with no previous experience of flash-light photography to guide them. A few experiments before they left England would undoubtedly have resulted in many cases in sharper and better lit pictures. On the other hand, many of the records might then have resembled snapshots taken in a zoo. As it is, on the whole the pictures succeed in conveying the eerie nature of the jungle at night. D. A. S.

SABEN'S COMMERCIAL DIRECTORY AND HANDBOOK OF Uganda, 1947–48. *Kampala, Uganda: Saben and Co.*, 1947. 9×6 *inches;* 336 *pages; maps.* 25*s*

This publication is a praiseworthy effort to provide practical information regarding the scope, organization and regulation of commerce and the facilities which are available to it in an African territory which may well be on the threshold of great changes. As such the student of economic geography should find in it a useful guide to realities.

A list of limited liability companies, about 650 in all, registered under local legislation is particularly enlightening, for about 85 per cent. of these seem to be under Indian direction. This reflects the extent to which the trade and secondary industries of East Africa are in Indian hands. Of the remainder, Africans are responsible for a negligible proportion. Here is food for serious thought. It is useless for Africans in Uganda to resent alien domination of the trade, and particularly the distributive trade, of their own country. The remedy is in their own hands. There is no crippling lack of educational facilities. Certainly experience has to be acquired. But integrity and thrift, real hard work and a sense of the need first to do small things well can prevail over much greater handicaps: and this is to-day's challenge to ambitious Africans. Meanwhile it is of interest that income tax is not levied on Africans nor on African-owned companies. So long as Africans acquiesce in such spoon-feeding they can hardly hope to guide their own destinies.

Various improvements will doubtless suggest themselves to the publishers of this work of reference when they come to prepare future editions. More information regarding the nature and working of the import trade would be useful. H. B. T.

THE ANATOMY OF LANGO RELIGION AND GROUPS. By T. T. S. HAYLEY. *Cambridge: University Press*, 1947. 8½×5½ *inches;* xii+208 *pages; maps, diagrams and illustrations.* 21*s*

The title suggests something in the nature of a rigorous dissection, a demonstration of structural features rather than of the "flesh and blood" of cultural life to which ethnographical accounts are more commonly devoted. This is indeed the aim of the book, which may be said to have been achieved with no mean success. The description of the "flesh and blood" is not absent; but it serves mainly to present instances in which the structure of the society may be discerned. In this respect the author's study is in harmony with the modern trend in social anthro-

pology; the harmony would have been even closer had the author's theoretical equipment been sounder and his observations planned (or reported) on a larger scale.

The limitation in the scope of the book is, I imagine, due to choice as well as opportunity; for the author was in a position to build upon a pre-existing account of the Lango—the work of the late Dr. Driberg, who had carefully studied this Nilotic tribe on the borders of the Sudan and Uganda. Mr. Hayley, a student of Driberg, went to the Lango furnished with his master's introductions, both in the physical sense (in the form of letters to Lango chiefs) and in the sense of advice and knowledge imparted. The re-examination of the same tribe by a competent anthropologist after an interval of many years proved most fruitful. The author could record the disappearance of ceremonies which Dr. Driberg had witnessed, and from it draw suggestive conclusions. Thus certain ceremonies serving to maintain or revive the unity of the tribe are no longer performed; they appear to have lost their meaning once Government removed the main problems which tribal unity had formerly to face, namely, internal and external warfare and the periodical threats of famine (p. 80). Mr. Hayley could also explore features of the culture which had escaped his predecessor. An example is the *etogo* organization, in which several clans are combined into a wider unit, visible in the ritual obligations of communal meat-eating, and vested with the power of magically controlling ancestral spirits. The exact status of the *etogo* in the hierarchy of Lango groupings, however, remains somewhat obscure; though the *etogo* is said to "unite" clans of the same locality (p. 50), the same *etogo* groups also seem to be scattered through disconnected local groups, and different *etogo* organizations appear to coexist in the same locality (p. 63). It is nowhere stated how many *etogo* groups occur in one locality, nor how many clans belong to each. The same lack of detail and quantitative information also detracts from the value of the chapters on clan and tribe.

The religious ceremonies, on the other hand, are described with great care, and are equally carefully analysed in terms of the "value" they have in mobilizing and sustaining the various forms of social grouping. Here it is interesting to note that ceremonies concerned with propagation and the physical continuity of the group—with marriage, progeny or the extension of kinship bonds in blood brothership—are predominantly based on the clan; while ceremonies concerned with the physical disruption of the group—funeral ceremonies, widow marriage and the propitiation of the dead—largely fall to the inter-clan organization of the *etogo*. The political group, which represents merely a fortuitous and variable gathering of local sections around a leader (*jago*), possesses no ceremonial beyond that of the consecration of the chief (p. 146).

The crucial concept in Lango religion is the *jok*, a concept closely akin to the Polynesian *mana*. It enters into ideas about health and disease, it shapes the Lango's view of the universe, and also assumes the meaning of a vital force activated in sexual intercourse and procreation (p. 12). "Medicine-men" harness the *jok* in beneficial fashion, sorcerers in an evil and anti-social sense. A suggestive problem arising here remains unanswered. The medicine experts, who make use of trances and dissociated states, are mostly women—the sorcerers (apparently) mostly men; here surely some link with the social structure should be discoverable.

To conclude, Mr. Hayley has presented us with a highly competent piece of field-work and a valuable theoretical study. The book is a condensation of an originally fuller account. Some of the shortcomings noted here may well be the results of this process. S. F. N.

NORTH AMERICA

ECONOMIC GEOGRAPHY OF CANADA. By A. W. CURRIE. *Toronto: Macmillan*, 1947. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* xiv+455 *pages; maps.* 16*s*

Professor Currie, who is an economist on the staff of the University of Toronto, originally planned to write this book in collaboration with Dr. N. F. G. Davis, geologist at the University of British Columbia. The untimely death of Dr. Davis made it necessary for Professor Currie to write the entire book himself, so that he has had to treat the physical side of Canadian geography as well as those aspects nearer to his own interests.

The professional geographer will read the book with disappointment and the student with bewilderment. In its entire 442 pages there is not a single original sketch-map or diagram; the scanty illustrations are chiefly Canada-wide maps of economic distributions reproduced from the Canada Year Book or other official papers. The text is made heavy and lifeless by the absence of effective headings, diagrams and statistical summaries. Apart from a couple of brief tables of population and production figures, the whole text is made to stand without any statistical backing. The reader will also be irritated by lengthy, inaccurate and irrelevant details of purely physical geography that are of no value in a study of this kind. The general section on climate in the first chapter, for example, contains a long account of the polar front theory of cyclone formation, as well as statements that the base of the counter-trades lies at "several hundred" feet and that warm front rains last about "2 or 3 days"! References to the "millions of years since the retreat of the ice" in the geological sections indicate that the author is equally uncomfortable on the physiographic side; 75,000 years would be a very generous estimate.

The general plan of the author has been to devote one chapter to each of the major geographic regions of Canada. Each chapter contains lengthy accounts of the principal forms of production, though the detail is hard to follow because of the absence of sketch-maps. Even in the economic sections of the text there are some astonishing lapses. The northern limit of wheat-farming is more than once given as the isotherm of 70° F. mean temperature for July, even though this isotherm nowhere enters the prairie provinces which supply a large part of the world's exportable wheat. Finally the geographer who has been accustomed to dividing the prairies into three main physiographic levels will be surprised to find these referred to as the "first steppe (*sic*), second steppe and third steppe."

Most of these deficiencies might have been corrected before publication had the book been adequately scrutinized, and it is earnestly to be hoped that the publisher will call for drastic revision before a further edition is contemplated.

F. K. H.

CENTRAL AMERICA

MEXICO CITY: the isthmus of Tehuantepec. By MIGUEL COVARRUBIAS. *London: Cassell*, 1947. $9\frac{1}{2} \times 6\frac{1}{2}$ *inches;* xxviii+427+viii *pages; maps and illustrations.* 45*s*

The author is a well-known Mexican artist and amateur archaeologist, who is dealing here with the southern part of the States of Vera Cruz and Oaxaca. His interest seems to be in the Pacific rather than the Atlantic seaboard, and his treatment is more anthropological and archaeological than geographical. It takes him back to a period before 200 B.C. to A.D. 300, in which he places the development of agriculture and the origin of many of the useful arts, including the beginning of hieroglyphic writing and the use of the calendar;

the earliest dated sculpture is 31 B.C. These Olmec peoples and cultures take their name from Olman, the rubber country, and somewhere between A.D. 300 and 600 they played a ceremonial ball game, presumably with rubber balls. In the early twelfth century their city was overthrown by the Nahuas, who were later conquered by the then savage Aztecs.

The author notes some interesting parallels with the old world. For example, both Chinese and Mexicans carved jade exquisitely, wore it as an amulet, made offerings of it, and buried it with their dead, painting their funeral jades with a coat of red cinnabar. The modern Zapotecs, like the ancient Tyrians, obtain an absolutely permanent purple dye from the slimy substance excreted by the Caracol snail when it is irritated. The species used in Mexico is *Purpura patula* and not the Mediterranean *P. halmastoma*. The subject has been dealt with by J. W. Jackson in *Manchester Memoirs*, vol. 9, no. 7, 1916. Shell-purple was known to the Chinese.

The capital of the modern Zapotec Indians is Juchitán, a town with 20,000 nearly pure Indian inhabitants. The life of these people is sympathetically described in some detail by the author, who gives examples of their modern ballad poetry, dresses, pottery, amusements, fiestas and so on. All this reveals a very full life, which in character is Spanish Christianity grafted upon the older Indian culture. The social and economic independence of the Zapotec women gives them a position of equality with men, but they are not feminists and their functions and customs are segregated. The Zapotec language is described briefly and possesses some unusual features, such as a system of tones in which the meaning of a word is often determined by the pitch of the voice, as in Chinese. The appendix contains a comparison between the vocabularies of the seven important Indian languages, a glossary and a bibliography. The book is illustrated with photographs in colour and numerous finely executed line drawings of rock carvings and other objects by the author himself. It makes a wholly delightful introduction to a most interesting country, now seldom visited by English people.

A. H. G. A.

PACIFIC

GUAM AND ITS PEOPLE. By LAURA THOMPSON. *Princeton: University Press (London: Oxford University Press)*, 1947. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* xiii + 267 *pages; maps and illustrations.* 27*s* 6*d*

This book appears at an opportune moment when attention is focused once again on this interesting remote island. The author is a professional anthropologist with seventeen years' experience in the Mariana Islands.

We are reminded of the significance of Guam for navigators of all ages from the time when Magellan placed it on the map in 1521. Its large harbour and fertile soil in the path of the south-east trades between Cape Horn and China made that route possible for Manila galleons as well as small trading craft carrying sealskins to Canton market. At a later date Guam became an important cable station where various cables intersected. It became a naval and radio station, as well as a busy port-of-call for steamers. It figured largely in the late Pacific war. To-day the airfields are being extended as it is the main airport between the U.S.A. and the Orient.

The author sets forth a most intensive examination of Guam's native culture throughout these endless vicissitudes, and shows that the main fabric has survived from the extinct aboriginal Chemorras. These were of Polynesian origin and not Melanesian as has been supposed. Cultural similarities are found among peoples of the Philippines and West Carolines, also in early Polynesian tribes.

The various outside influences are dealt with—Malayan, Spanish, Japanese and American—which have made changes in the native life. But the ancient social organization exists although the class to-day has replaced the family as the chief social unit. All religious observances (which are Roman Catholic) and all marriages and funerals are carried out as a unit. Descent is still matrilineal as it was among the Chemorras.

A chapter is devoted to a recommendation for a more systematic long-range plan of training for the people with self-government as the aim. The author considers that up to the present the population has not been encouraged in self-development, but has only been looked upon from the point of view of its utility by the ruling powers, including America.

It is a very thorough and well-reasoned presentation of the subject, the result of concentrated study of every aspect. There are good maps and excellent illustrations. L. E. C.

POLAR REGIONS

FIFTY YEARS BELOW ZERO: a life-time of adventure in the Far North. By CHARLES D. BROWER. *New York: Dodd, Mead and Co.*, 1947; *London: Robert Hale*, 1948. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* viii+310 *pages; illustrations.* 21*s*

These memories of one of the great characters of the Arctic tell us the remarkable history of the north coast of Alaska over a period of fifty-eight years. When as a young man Charlie Brower gave up the sea to prospect for coal in Alaska he little thought that he would make his home there for the rest of his life. In those days, the 'eighties and 'nineties, the Eskimo of northern Alaska were primitive, superstitious and little understood. The white men who came to whale or trade with them were afraid of them and took every opportunity to rob them. Brower seems to have taken a liking to the natives at the start. He learnt to travel with them and hunt the whale in their own way. Soon he had many friends among them who came to respect him for his resource and courage. His description of their life and ways is of the greatest interest. In particular the methods of the Tigara whale hunters, who in his day still hunted with flint-headed weapons by a technique wrapped in mysterious taboos, are described in the author's lively style, and he is probably the only white man to have hunted with them before they adopted new weapons. Dr. Rainey in his monograph 'The whale hunters of Tigara' confirms the author's facts from a close study of the ethnology of these people.

Brower's home was at Barrow near the most northerly point of Alaska, but he was not confined to a narrow settlement life. He hunted and travelled all over the country and every few years went "outside" for a visit to the States. Among his many friends he can count most of the notable arctic travellers of his time. Stefansson was one of his early visitors and remained a life-long friend. He has written an introduction to the book in which he expresses admiration for all the author has done to help travellers on the Alaskan coast. Roald Amundsen was another, and when he had accomplished the North West Passage Brower was the first to greet him. Wilkins used Brower's station as a base for his polar flights and Knud Rasmussen stayed with him during his expedition from Greenland to investigate the Eskimo. The author seems to have made friends with them all whether they came by sledge, ship or aeroplane and has good words to say of each one.

Humour, adventure and tragedy follow one another swiftly in the book. The author's own changes of fortune, the Eskimo way of life and the impact of the white man upon it, and the rescues of whites and natives are all told in an

easy style that holds our interest. For this is not only the life story of one exceptional man but also the history of a people emerging from the stone age to Christianity and civilization.

One cannot fail to be impressed with the fine character of the author. To have brought half of the thirty-two men of the *Navarch* to land after twelve days' marching over the pack without food, to have saved the Eskimo community from "hooch" and from the diseases which invaded them, prove him to be a man of the highest qualities of leadership and true humanity. This book can be recommended as one of the best descriptions of life in the Arctic that has been written. A. C.

ECONOMIC GEOGRAPHY

THE USE OF AERIAL SURVEY IN FORESTRY AND AGRICULTURE.

By J. W. B. Sisam. (Imperial Agricultural Bureaux, Joint Publication No. 9.) *Oxford: Imperial Forestry Bureau; Aberystwyth: Commonwealth Bureau of Pastures and Field Crops*, 1947. 10×7½ *inches; 59 pages; illustrations. 7s 6d*

The most interesting portion of this useful little book is undoubtedly the collection of sixty-seven half-tone illustrations of air photographs intended to depict "various types and conditions of vegetation and land use and misuse in different parts of the world, particularly in the tropics." Some are familiar friends from the cameras of J. L. Rich and Mary Light; some are from commercial air surveys and many from service sources. They include low and high level obliques, large- and small-scale verticals and some stereo-pairs. As a whole the collection illustrates admirably the varied characteristics of the several types of air photograph and the variety of information that they can convey, but it is regrettably marred by inadequate documentation. Such vital details as the date (and often even the place) of photography, the scale of vertical photographs, and the altitude of photography in the case of obliques, are inexcusably omitted. Moreover the stereo-pairs offered here will not win many converts to this admirable method of examining vertical photographs. The paired photographs have been reproduced with their left and right images separated by variable amounts which are often below 40 and sometimes below 30 mm. Fusion of images set as close as this is virtually impossible, and anyone who attempts it will find himself unable to read common print for some time afterwards.

The forty-nine pages of text review the factors affecting the usefulness of air survey in the fields indicated by the title. An introduction which considers the broad advantages and limitations of air photography is followed by a discussion of such operational factors affecting cost as cameras, scale, overlap and organization and a summary statement of the ways in which photographs can be employed. The latter include map-making with automatic stereoscopic plotting instruments; land classification by photographic interpolation; the use of photographs as basic field documents in soil, forest, vegetation or land-use surveys; and forest mensuration. This is no manual of instruction and only the essentials of any method are indicated, but in the following chapter a compact and interesting summary is given of the methods employed and results achieved in actual air surveys of vegetation and land-use down to 1946 in Australia, Canada, U.S.A., U.S.S.R., Burma, Honduras, Nigeria, Rhodesia, Tanganyika, Uganda and Trinidad. Not the least valuable feature of Professor Sisam's book is a bibliography of ninety-six entries. D. L. L.

PHYSICAL AND BIOLOGICAL GEOGRAPHY

TROPICAL AND EQUATORIAL METEOROLOGY. By MAURICE A. GARBELL. *London: Sir Isaac Pitman and Sons*, 1947. 11×9 *inches;* xvi+237 *pages; maps and illustrations.* £3

This is quite a comprehensive treatise on the circulation of the atmosphere and associated weather over that half of the globe comprised between the 30th parallels of latitude north and south. The author, as an aeronautical meteorologist, maintains the three-dimensional outlook well to the fore and is thus able to explain many facts which would otherwise be obscure, particularly in relation to such controlling factors as the subtropical anticyclones and the inter-tropical front. The first part of the book discusses the general circulation, air masses, clouds, anticyclones, fronts, tropical cyclones and the like, whilst the second deals with regional tropical weather on the basis of the first.

Though there is inevitably some mathematics this will not hamper the non-mathematical reader unduly, and the text is relieved of dullness by the avoidance of mere categorical designation and the inclusion of some vivid descriptive passages. Thus of the Gulf Stream as seen from the air we read: "The colour of the Gulf Stream is a deep blue; in cool air the steaming of the water is quite visible. Along the edges or *cold walls* of the current, ripples or nearly vertical underwater waves similar to the frontal waves in the atmosphere are clearly visible from above. These underwater waves along its cold wall, formed between water masses that differ in density and velocity, are an interesting curiosity to the meteorologist."

The account of tropical cyclones, to which a whole chapter is given, is well abreast of modern theory, but that of the South-west Monsoon and other important features of tropical weather is in many ways defective. It is interesting to know that the record world temperature of 137° F. at Azizia, some 25 miles inland from Tripoli, on 13 September 1922 was critically determined by the descent of already intensely heated sirocco air from a plateau 2000 feet high. Had the wind not been blowing down-slope so that it became dynamically warmed by compression a further 11°, the maximum temperature on that torrid day would only have been 126°!

In speaking of violent weather phenomena encountered in the tropics, the author is misleading in stating that comparatively mild types of tornadoes and hail storms also occur in middle latitudes. No reference is made to the well-known pre-eminence of tornadoes in the middle and eastern parts of the United States; and surely the summer hail storms of France and Italy, the United States and Canada, and above all the Transvaal are a by-word. Hail is less frequent in the tropics, as indeed the author admits, and it is probably also less violent there except on high plateaus.

Comprised within the tropics are the three wettest tracts of country on the globe, where the mean annual rainfall is of the order of 400 inches, namely the Khasi Hills of Assam, Cameroon Mountain in West Africa, and the mountains of Hawaii. With regard to the first two Dr. Garbell observes quite correctly that the orographic ascent of warm moist monsoon air is facilitated by the funnel-shaped configuration of the slopes causing rapid convergence of the air currents. The explanation given however of the Hawaiian wet area, which has always been more difficult, is far from convincing. Though the air of the North-east Trade wind originating in the North Pacific anticyclone is here subsiding or descending in its upper levels, Dr. Garbell thinks that the current is so deep that it can ascend the obstructing mountain slopes sufficiently to produce heavy rain. Nevertheless, in a general discussion on orographic rainfall

opened by the reviewer at the Royal Meteorological Society in 1945 (*Q.J.R. Met. Soc.*, 71 (1945) 41) it was agreed that orographic uplift is not easy unless the air is in a potentially, if not actually, unstable state, so that the local problem of Hawaii needs re-examination in this light.

This book's commendably original outlook is marred by a disconcerting aloofness from other authors and familiar points of view (in spite of an extensive bibliography and full acknowledgment in the preface of assistance from various authorities), making it difficult to tell when the author is speaking on his own authority or otherwise. Moreover, the very circumstances of the book are puzzling. The place of publication, London, is the sole reference of any kind to this country in its pages, and there is not the slightest clue to the author's nationality, place of residence or meteorological connections. The numerous diagrams with which the work is somewhat overloaded, though beautifully executed, are often involved, and their large compass has led to the inconvenient shape of the volume. Those readers who, like the reviewer, are not diagram-minded, will probably find it less tedious to read the text independently of the diagrams which, with their legends, can be studied separately. There are excellent maps and a few telling photographs of lightning and clouds. L. C. W. B.

THIS GREAT AND WIDE SEA. By R. E. Coker. *Chapel Hill: University of North Carolina Press (London: Geoffrey Cumberlege, Oxford University Press)*, 1947. $9\frac{1}{2} \times 6\frac{1}{2}$ *inches;* xvii+325 *pages; maps, diagrams and illustrations.* 27*s* 6*d*

Professor Coker aims—and succeeds—at a brief and comprehensive presentation of the basic phenomena of the oceans to provide the background of information necessary to students of marine biology, and sufficiently non-technical to encourage anyone who wishes to know more about the sea. He realizes the difficulty of dealing with some complex aspects of the subject in few words, but hopes to spare others the labour of delving into more technical works.

A few proper names are sometimes spelt incorrectly; and in mentioning the *Discovery II*, Arctic has been substituted for Antarctic. The attempt to explain the tidal humps on the sides of the earth facing towards and away from the moon is misleading because it is the horizontal components of force in these directions (parallel to the earth's surface) that are responsible for the tides; the effect of the upward pull (perpendicular to the earth's surface) is negligible. The horizontal components of force are due to the rotation of the earth and moon round their common centre of gravity as well as to the attractive force of the moon. The analogy between the whale and a diver on page 110 is false because the whale's lungs are filled only once with air, while the diver has a continuous supply of air pumped down to him. The work of Marcet, Forchammer and Dittmar is more significant than that of Maury in establishing the constancy of composition of the dissolved salts in the oceans, and it is doubtful whether the abundance of organic life in cold waters can be attributed directly to the greater content of dissolved gases (p. 195).

These are small points which detract little from the value of the book. By his objective surveys of the interrelations between physical, chemical and biological processes, and by focusing attention on many problems whose solution is a matter of great interest (the need for a study of the mechanics of flotation (p. 108), for example), the author has done a very useful service to oceanography. By writing such a readable account of the subject he has made it more approachable to those who are interested but not trained in science, and has no doubt helped to make the benefit of recent discoveries more immediate. The book is well illustrated; it can be thoroughly recommended. G. E. R. D.

ADDITIONS TO THE LIBRARY AND MAP ROOM

EUROPE

RATIONAL FISHING OF THE COD OF THE NORTH SEA

By Michael Graham. (Buckland Lectures.) $7\frac{1}{2} \times 5$. 112 pp. Diagrams. *London: Edward Arnold*, 1948. 5*s*

THE 1 : 1250 RE-SURVEY OF GREAT BRITAIN

By Brig. R. P. Wheeler. (*Empire Survey Rev.* 9 (1948) 234–47; illustrations.)

SEA-SHORE LIFE OF BRITAIN

By L. R. Brightwell. (*The British Nature Library.*) $8\frac{1}{2} \times 5\frac{1}{2}$. xii+116 pp. Illustrations. *London: B. T. Batsford*, 1947. 12*s* 6*d*

THE CENTRAL ENGLAND DISTRICT

By F. H. Edmunds and K. P. Oakley. (*Brit. Regional Geology.*) 2nd ed. $9\frac{1}{2} \times 6$. iv+80 pp. Illustrations, etc. *London: Geol. Survey*, 1947

MURRAY'S BUCKINGHAMSHIRE ARCHITECTURAL GUIDE

Ed. by John Betjeman and John Piper. $10\frac{1}{2} \times 7\frac{1}{2}$. xii+132 pp. Illustrations. *London: John Murray*, 1948. 15*s*

An attractive series of annotated photographs of buildings and their decorations arranged chronologically.

FELL DAYS

By Graham Sutton. $8\frac{1}{2} \times 5\frac{1}{2}$. 222 pp. Illustrations. *London: Museum Press*, 1948. 12*s* 6*d*

THE GEOLOGY OF THE HIGHLAND BORDER: Stonehaven to Arran

By J. G. C. Anderson. (*Trans. R. Soc. Edinburgh*, 61 (1948) 479–516; maps)

THE INDUSTRIAL DEVELOPMENT OF DUNDEE

By Sir Garnet Wilson. (*Advancement of Sc.* 5 (1948) 123–28.)

WASSERHAUSHALT UND WALDVERWÜSTUNG: Ergebnisse der Tagung des Naturhist. Ver. der Rheinlande, 30. April 1947. (*Decheniana*, 103 (1948) 134 pp.)

Nine papers dealing with the ill-effects of excessive forest destruction in western Germany.

FRAGEN DER NORDWESTDEUTSCHEN SIEDLUNGS- UND FLURFORSCHUNG IM LICHTE DER OSTFORSCHUNG

By H. Mortensen. (From *Nachr. Akad. Wissens. Göttingen, Phil. Hist. Kl.* 1946–7, 37–59)

GRIECHENLANDS ZWEI SEITEN

By A. Philippson. (*Erdkunde, Bonn*, 1 (1947) 144–62)

Contrasts the geographical characteristics of western and eastern Greece.

I LAGHI DI FRANA DELL'APPENNINO ROMAGNOLO

By L. Gambi. (*Bull. Soc. Geogr. Ital.* ser. viii, 1 (1948) 10–54; diagrams)

ROTTERDAM AND WATERWAY APPROACHES TO THE RHINE

By F. W. Morgan. (*Economic Geogr.* 24 (1948) 1–18; illustrations)

OS TERRAÇOS DO GUADIANA A JUSANTE DO ARDILA

By Mariano Feio. (*Centro de Estudos Geogr., Lisboa.*) 9×6. 82 pp. Illustrations and maps. Lisboa, 1947

An interpretation of the quaternary river terraces of the Guadiana.

EL CLIMA DE CATALUÑA E INTERPRETACION DEL REGIMEN DE SUS RIOS

By V. Masachs Alavedra. (*Pirineos*, 3 (1947) 233–61; illustrations)

PERFILES LONGITUDINALES DEL RIO GENIL Y DE SUS PRINCIPALES AFLUENTES

By A. Revenga Carbonell. (*Estudios Geogr.* 8 (1947) 629–97; maps)

LA RIBERA DE BIESCAS

By J. M. Fontboté Musolas. (*Pirineos*, 4 (1948) 39–88)

Geomorphology of a small district in the Pyrenees.

THE POPULATION OF GUERNSEY: an essay in hist. geography

By G. H. Dury. (*Geography*, 33 (1948) 61–9; maps)

THE DISTRIBUTION OF POPULATION IN THE MALTESE ISLANDS

By G. W. S. Robinson. (*Geography*, 33 (1948) 69–78; sketch-maps)

ASIA

GREAT PLAIN-BUILDING IN NORTH CHINA

By C. P. Christopoulos. (*Bull. Geol. Soc. China*, 27 (1947) 299–319; maps)

VESTIGES OF CORRIE-GLACIATION ON THE KWEICHOW PLATEAU

By J. S. Lee. (*Bull. Geol. Soc. China*, 27 (1947) 35–53)

THE TSINLING AND TAPASHAN AS A BARRIER TO COMMUNICATIONS BETWEEN SZECHWAN AND THE NORTHWESTERN PROVINCES

By Lin Chao. (*J. Geogr. Soc. China, Nanking*, 14 (1947) 5–14)

DER MINYA KONKA: eine geographische Skizze

By E. Imhof. (*Geogr. Helvetica*, 2 (1947) 243–55; illustrations)

A description of the great mountain on the western border of China.

SOME IRRIGATION PROBLEMS IN IRAQ

By J. D. Atkinson. (Lecture to Anglo-Iraqi Soc.) Typescript: 12½×8; 24 pp.; illustrations and sketch-maps. 1948

A SCIENTIST WITH PERRY IN JAPAN: the Journal of Dr. James Morrow, ed. by A. B. Cole. 9×6. xxxvi+308 pp. Illustrations. *Chapel Hill: Univ. of N. Carolina Press (London: G. Cumberlege)*, 1947. 22*s*

LES CONDITIONS NATURELLES DE L'OCCUPATION HUMAINE AU LIBAN

By E. de Vaumas. (*Ann. de Géogr.* 57 (1948) 40–9; illustrations)

THE SOILS OF PALESTINE: studies in soil formation and land utilization in the Mediterranean

By A. Reifenberg. 2nd ed. 8½×5½. 180 pp. Illustrations. *London: Thomas Murby*, 1947. 16*s*

THE ISLAND OF NORTH KEELING

By C. A. Gibson-Hill. (*J. Malayan Br. R. Asiatic Soc.* 21 (1948) 68–103; illustrations and maps)

Account of the flora and fauna of an uninhabited island of the Cocos–Keeling group.

AFRICA

RECENT DISCOVERIES IN THE EGYPTIAN FAIYUM AND SINAI

By Wendell Phillips. (*Science*, 107 (1948) 666–70)

Deals with the work of the Univ. of California African Expedition.

TRIBES OF THE LIBERIAN HINTERLAND

By G. Schwab; ed. by G. W. Harley. (*Papers Peabody Mus. Amer. Archaeol.* 31 (1947). xx+526 pp. Illustrations and maps)

A finely illustrated account based on field-work in 1928, and covering all cultural elements. It is accompanied by a map of Liberia on scale of 1/534,000, compiled by the Institute of Geographical Exploration, Harvard.

A STUDY OF INCOME AND EXPENDITURE IN NORTHERN ZARIA [N. Nigeria]

By F. J. Pedlar. (*Africa*, 18 (1948) 259–71)

SLOPE FORM AND DEVELOPMENT IN THE INTERIOR OF NATAL, S. AFRICA

By T. J. D. Fair. (*Trans. and Proc. Geol. Soc. S. Africa*, 50 (1947) 105–20)

FISHERMEN OF THE BANGWEULU SWAMPS

By W. V. Brelsford. (Rhodes-Livingstone Papers, 12.) 8½×5½. 170 pp. *Oxford: Univ. Press (for the Institute)*, 1948

NORTH AND SOUTH AMERICA

NORTH AMERICAN EXCURSION

By Ernest Young. 9½×6½. 310 pp. Illustrations and maps. *London: Edward Arnold*, 1947. 21*s*

Mr. Young crossed N. America largely by bus and boat via the St. Lawrence, the Mississippi, and across from New Orleans to San Diego. His narrative is full of interest, geographical and historical, and enlivened with incidents of travel. An excellent feature is the numerous sketch-maps, and the photographs are also good.

CANADA'S NEW NORTHWEST

(The North Pacific Planning Project; Charles Camsell, Director). 11×8½, 156 pp. Maps. N.P., 1947

A study of the present and future development of Mackenzie District of the N.W.T., the Yukon, and the northern parts of Alberta and British Columbia, compiled by M. W. Maxwell from numerous special studies. The sections include physiography and geology, agriculture, forestry, water power, and transportation.

DROUGHT IN THE CANADIAN NORTHWEST

By Marie Sanderson. (*Geogr. Rev.* 38 (1948) 289–99; maps)

TOPOGRAPHIC MAPPING IN THE UNITED STATES

By E. S. Massie. (*Canadian Surveyor*, Feb. 1948, 21–33)

THE PARADOXICAL RIVERS OF THE GREAT PLAINS

By O. F. Evans. (*Sc. Monthly*, 67 (1948) 54–7)

ON THE DATE OF THE LAST RISE OF SEA-LEVEL IN SOUTHERN NEW ENGLAND

By E. S. Deevey. (*Amer. J. Sc.* 246 (1948) 329–52)

UN CAPITULO DE LA GEOGRAFIA ECONOMICA DE MEXICO: la pesca

By B. F. Osorio Tafall. (*B. Soc. Mexicana de Geogr.* 63 (1947) 359–402)

CULTURAL GEOGRAPHY OF THE MODERN TARASCAN AREA [Michoacan]
By R. C. West. (*Smithsonian Inst.: Inst. of Social Anthrop. No.* 7.) 10×8. 78 pp. Maps and illustrations. *Washington*, 1948

HANDBOOK OF SOUTH AMERICAN INDIANS
J. H. Steward, editor, Vol. 3. The tropical forest tribes. xxiv+986 pp. Vol. 4. The circum-Caribbean tribes. xviii +610. (*Bull. Bureau American Ethnol.*, 143.) 9×6; illustrations and sketch-maps. *Washington*, 1948

THE BEGINNING OF BRITISH HONDURAS, 1506–1765
By E. O. Winzerling. 8×5½. 90 pp. *New York: North River Press*, 1946

ACCLIMATIZATION IN THE ANDES: historical confirmations of climatic aggression in the development of Andean man
By Carlos Monge. 8×5½. xx+130 pp. *Baltimore: Johns Hopkins Press*, 1948

CONTRIBUIÇÃO AO ESTUDO DA GEOGRAFIA DA REGIÃO SUDOESTE DA BAHIA
By A. J. Porto Domingues. (*Rev. Brasileira de Geogr.* 9 (1947) 185–244; illustrations and sketch-maps)

AUSTRALASIA AND PACIFIC

THE BIRDSVILLE TRACK
By George Farwell. (*Walkabout, March* 1948, 9–17; illustrations)
A description of the Marree–Birdsville Stock Route.

ORE GENESIS IN QUEENSLAND
By O. A. Jones. (Repr. fr. *Proc. R. Soc. Queensland*, 59 (1947) 91 pp.; maps)

SOME CORAL REEFS OF THE SAHUL SHELF
By C. Teichert and R. W. Fairbridge. (*Geogr. Rev.* 38 (1948) 222–49; maps and photographs)
A study of the little-known coral reefs of N.W. Australia, based upon air photographs.

WATER SUPPLY IN THE AGRICULTURAL AREAS OF WESTERN AUSTRALIA
By T. L. Smith. (*Australian Geogr.* 5 (1947) 115–56; maps)
"A study in the technique of regional investigation."

SOME POST-GLACIAL CLIMATIC CHANGES IN CANTERBURY AND THEIR EFFECT ON SOIL FORMATION
By J. D. Raeside. (*Trans. and Proc. R. Soc. New Zealand*, 77 (1948) 153–71)

THE EXPLORATION OF THE PACIFIC
By J. C. Beaglehole. 2nd ed. 9×5½. xvi +412 pp. Maps. *London: A. and C. Black*, 1947
This is the best history of Pacific exploration down to the age of Cook. The bibliography has been revised and extended.

EXTRÊME-ORIENT ET PACIFIQUE
By Roger Lévy. 2nd ed. (Collection A. Colin.) 6½×4½. 200 pp. *Paris: A. Colin*, 1948. *Frs.*120
A sketch of the political geography.

GENERAL

THE SIZE OF THE UNIVERSE
By F. J. Hargreaves. 7×4½. 176 pp. Illustrations. *London: Penguin Books*, 1948. 1*s* 6*d*

ERUPTIVE ROCKS; their genesis, composition, classification, and their relation to ore-deposits
By S. J. Shand. 3rd ed. 8½×5½. xvi +488 pp. Diagrams. *London: Thomas Murby*, 1947. 30*s*

DIE FORMEN DER SOLIFLUKTION UND DIE PERIGLAZIALE BODENABTRAGUNG
By C. Troll. (*Erdkunde, Bonn*, 1 (1947) 162–75)

L'EMIGRATION SUISSE HORS D'EUROPE DANS L'ENTRE-DEUX-GUERRES (1919–39)
By H. E. Vogel. (*Geogr. Helvetica*, 3 (1948) 1–103; diagrams)

LES VILLES: APERÇU DE GÉOGRAPHIE HUMAINE
By Georges Chabot. 6½×4. 224 pp. *Paris: A. Colin*, 1948. *Frs.*120
A useful summary of recent studies in the evolution, structure and functions of towns.

GEOGRAPHIC AND OTHER SCIENTIFIC TECHNIQUES FOR POLITICAL SCIENCE
By S. W. Boggs. (From *Amer. Political Sc. Rev.* 42 (1948) 223–38; diagrams)
Urges an approach to political problems by the development of new techniques in field observation and historical research, and the analysis of the results in new types of maps and diagrams, which would allow changing space relations to be adequately studied.

PETRUS PLANCIUS: theoloog en geograaf, 1552–1622
By J. Keuning. 9×6. 188 pp. Illustrations. *Amsterdam: P. N. van Kampen*, 1946. 15*s*
A biographical sketch of the well-known cartographer, emphasizing his connections with the Dutch East India Co., and the progress of overseas expansion.

ALEXANDER THE GREAT. I. Narrative. II. Sources and studies
By W. W. Tarn. 8½×5½. Vol. i, xii+162; ii, xiv+178. Maps. *Cambridge: Univ. Press*, 1948. 10*s* 6*d*; 30*s*
An important contribution to history, this work includes valuable material on the historical geography of Asia.

ATLASES AND MAPS

THE REGIONAL ATLAS OF THE WORLD by John Bartholomew. Introduction by A. G. Ogilvie. *Edinburgh: The Geographical Institute*, 1948. 45*s*

GREAT BRITAIN. GEOLOGICAL MAP OF ENGLAND AND WALES. 1:625,000. *London: Geological Survey*, 1948

ADMIRALTY CHARTS. 6 New Charts, 7 New Editions, 27 Large Corrections, 6 "Decca" Lattice Charts. *London: Hydrographic Dept., Admiralty*, 1948

EUROPE

GREAT BRITAIN. ORDNANCE SURVEY. Six-inch Map. 248 sheets. 1:25,000 or about 2½ inches to 1 mile. 173 sheets. *Chessington*, 1948

GREAT BRITAIN. GEOLOGICAL SURVEY. England and Wales 1:63,360. Drift Sheets: 239, 255, 269, 314, 315, 327; Scotland 1:253,440. Sheet 6. 1:63,360 Arran, Drift and Solid. *London*, 1948

ENGLAND AND WALES. PROPOSED NATIONAL PARKS and Conservation Areas, Scientific Areas and National Nature Reserves. 1:253,440. 11 sheets. *London: Ministry of Town and Country Planning*, April 1948

EIRE. ORDNANCE SURVEY. 1:10,560 Louth sheet 8; 1:25,000 Dublin, Popular and Administrative editions; 1:63,360 Wicklow District; 1:250,000 Shannon Airport Instrument Approach Chart. *Dublin*, 1948

POLAND. FIZYCZNO-POLITYCZNA MAPA POLSKI. 1/1M. Wiktor Romanow. *London*, 1945

SCANDINAVIA 1/2·5M. *Edinburgh: Bartholomew*, 1948

ASIA

PALESTINE. The Jewish Chronicle Map of Palestine. 1:285,120. *London: Geographers' Map Co. Ltd.*, 1948

TÜRKIYE 1:500,000. 21 sheets. 1:800,000. 8 sheets. *Ankara: Harta Genel Müdürlügü*, 1946–47

AFRICA

CARTE GÉOLOG. INTERNAT. DE L'AFRIQUE 1/5M. Feuille No. 2. *Paris: Bureau d'Etudes Géologiques et Minières Coloniales*, 1948

GAMBIA 1:50,000. 9 sheets. *Teddington: Directorate of Colonial Surveys*, 1948

GAMBIA ROAD MAP 1:500,000. Second Edition. Compiled and drawn by B. A. McArthur-Davis. *Bathurst: Survey Dept.*, 1947

TANGANYIKA TERRITORY 1:125,000. 7 sheets. *Dar es Salaam: Dept. of Lands and Mines*, 1948

AMERICA

CANADA. NATIONAL TOPOGRAPHIC SERIES. 1:63,360 5 sheets; 1:126,720 1 sheet; 1:253,440 5 sheets; 1:506,880 3 sheets. *Ottawa: Dept. of Mines and Resources*, 1948

BRAZIL. MAPA DO BRASIL 1/5·75M. *Rio de Janeiro: Instituto Brasileiro de Geografia e Estatistica*, 1945

AUSTRALIA

AUSTRALIA, compiled and drawn in the Cartographic Section of the National Geographic Society. 1/6M. *Washington: Nat. Geogr. Soc.*, 1948

TASMANIA. CLIMATIC REGIONS prepared from information supplied by Dr. J. Gentilli. 1:1,013,760. *Hobart: Department of Lands and Surveys*, [1948]
Map No. 25 for the atlas "Economic Resources of Tasmania."

POLAR REGIONS

ARCTIC. STRATEGIC PLOTTING CHART—Arctic Regions. 1:2,188,800 at Lat. 67° 30′. 6 sheets. *Washington: Hydrographic Office*, 1946
Mercator Projection of the area between 59° and 75° N. Latitude; contoured at 1000 feet interval.

FALKLAND ISLANDS DEPENDENCIES 1:500,000 South Shetlands and Graham Land. 5 sheets. *Teddington: Directorate of Colonial Surveys*, 1948

THE SOCIETY'S NEWS

GRANTS FOR GEOGRAPHICAL EXPLORATION AND RESEARCH

Applications to the Society for direct grants in aid of geographical exploration and research, or for recommendations to other bodies for financial support, should reach the Director each year not later than March 31. In making application, candidates should state in some detail the scheme of research or exploration proposed, its estimated total cost, and the amount of the grant requested. They should also name any other bodies to whom similar application is being made. In the case of individual candidates not already sponsored by a scientific or educational organization, the names of two referees should be given, at least one of whom should be an authority in the particular field of research or exploration proposed.

THE SOCIETY'S CHRISTMAS CARD

In 1850 the *Enterprise* and *Investigator* left England to search for the Franklin expedition by way of the Pacific. Commander R. le M. McClure in the *Investigator* reached the rendezvous north of Bering Strait before Captain R. Collinson who was in command of the expedition. Without waiting for his chief, he pressed on in an endeavour to reach Melville Island. He discovered Prince of Wales Strait east of Banks Island (Baring Island) but was unable to enter Melville Sound. The following season he turned on his tracks, hoping to reach the Sound by the west coast of Banks Island. North of Cape Kellett however he encountered difficult ice conditions. To prevent the ship being carried away, she was made fast to an ice floe. After being lifted six feet out of the water by the pressure of the ice, and in danger of driving on to the beach, she was providentially extricated. It is this incident which is depicted by Lieutenant Gurney Creswell, whose water-colour "Critical position of H.M.S. *Investigator*, Baring Island, 1851" is reproduced on the R.G.S. Christmas card for 1948. This is one of a series of paintings by the same artist printed and published by Day and Son, the London lithographers. The *Investigator* was finally abandoned in Mercy Bay, her crew reaching the *Resolute* in Melville Sound in 1853.

NEW FILM PROJECTOR

Since the inception of 16 mm. film projection in the Society's Hall the provision of a brightly illuminated picture of useful size over the 65 feet projection distance has always proved difficult when using the 1000-watt lamp and optical system of the average projector. Research into the problem has now produced an apparatus which combines the arc of standard cinema practice with the usual 16 mm. film transport mechanism. The experimental stages of the design involved alteration of a standard cinema mirror arc to give a concentration of light focused for use with the smaller film gauge, the choice of a machine suitable for adaptation, and the provision of an efficient cooling system to dissipate the great heat generated. The construction of the apparatus was hindered by the lack of interest displayed by large manufacturers and the work was undertaken eventually by a small firm in Guildford. E. E. T. D.

PRESENTATION OF THE PATRON'S MEDAL TO INSPECTOR LARSEN, R.C.M.P.

Through the courtesy of the Agent General for British Columbia in London, we have received the following account by Mr. J. S. Matthews, City Archivist

of Vancouver, of the presentation of the Patron's Medal of the Society to Inspector H. A. Larsen, Royal Canadian Mounted Police. The award was made to Inspector Larsen in 1945 for his remarkable achievement of the North West Passage in the *St. Roch* from west to east in 1940–42, and from east to west in one season in 1944. The medal was carried to Canada this summer by Dr. Charles Camsell, President of the Canadian Geographical Society, who received the Founders' Medal for the same year. Mr. Matthews writes:

Yesterday, October 25, at the Royal Canadian Mounted Police Barracks, Vancouver, Superintendent John Healey, in the presence of the Force, officers and men in full dress uniform (red coats, etc.), and the immediate relatives of the recipients, presented Inspector Henry Larsen, F.R.G.S., with a bar to the King's Polar Medal he wears, and the Gold Medal of the Royal Geographical Society. I was privileged to witness the presentation.

It was a delightful impressive ceremony. The Force was drawn up in line facing the picturesque barrack headquarters of the Royal Canadian Mounted Police, upon the greenest of lawns in the centre of which is the flagstaff where the Union Jack flies. A central table, covered with the Union Jack, and facing it a row of chairs for the guests, was on the lawn, the line of "red coats" beyond. I never saw red so red or green grass so green. Inspector Larsen received the bar to his Polar Medal and the Gold Medal of the Royal Geographical Society, and Corporal G. W. Peters received a bar to the Polar Medal. Special Constables R. T. Johnson and W. M. Cashin received the Polar Medal. Polar Medals are so rare that I am reporting the unusual incident to you. As for the Gold Medal, R.G.S., I think there is one other only in Canada. The formality was solemn, dignified and faultless.

PROFESSIONAL EXAMINATION FOR LAND SURVEYORS, AND INSTRUCTION IN SURVEYING AT THE SOCIETY'S HOUSE

The Council of the Royal Institution of Chartered Surveyors has now approved the formation of a land surveying group within the Institution's membership, and the establishment of a new sub-division of the examinations to be known as Sub-Division V (Land Survey). This will meet a long-felt need amongst land surveyors, a need that was emphasized at the British Commonwealth Survey Officers' Conference in August 1947. It is hoped that the Intermediate Examination will be specified as a recruitment qualification for entry into the professional grades of the Ordnance Survey Department (in Great Britain) and of the Colonial Survey Service. It is further hoped that the Final Examination—in addition to qualifying for membership of the Institution—will serve as a promotion test within the two Services, and also in the Military Survey Service; and that the full qualifications in the Land Surveying Division may in due course be recognized throughout the Empire, and a degree of reciprocity secured with the Dominions and those colonies having their own statutory examinations for licensed land surveyors.

The first examination will be held in 1949, the First and Intermediate Examinations in April and October. Printed copies of the syllabus and other particulars may be obtained from the Royal Institution of Chartered Surveyors, 12, Great George Street, Westminster, S.W.1.

In view of the above it has been decided that there will no longer be any demand for the Royal Geographical Society's Diploma in Surveying, especially as the new examination carries with it a professional qualification.

The Society's Diploma was first awarded in the days of Mr. E. A. Reeves after the first world war, when it met the needs of the Colonial Survey Service and of ex-service surveyors. Later this demand was met by specialized courses

in surveying at Oxford and Cambridge Universities, though recently the Diploma was revived in response to many requests. While it is sad to say farewell to the Society's Diploma, we warmly welcome the introduction of the Land Survey sub-division of the Royal Institution of Chartered Surveyors.

The past few years have seen a gradual extension of instruction in surveying in the universities and elsewhere, and at the same time there has been a gradual disappearance of the small, privately financed expedition with its amateur surveyors who were prepared to spend three months taking a course. To-day expeditions are manned either by professional surveyors or by scientists who know the basic principles and only require specialized instruction. As a result the Society's policy has been to employ a part-time instructor who is responsible for research work and for the surveying instruments which are available to expeditions, and who is prepared to give instruction in any particular branch of surveying. Full-length courses in all branches are no longer provided. Instruction is usually given by the hour at a time mutually convenient to the instructor and student. In the past two years it has often been the practice for a student to have only one or two hours' actual instruction a week, and to spend many hours using the Society's instruments and textbooks with occasional supervision from the instructor. In this way almost any need can be met, whether it be for a revision of field astronomy for a "pipe-line" survey; for studying the use and adjustment of instruments for an external degree, or for practice with a plane-table in order to make a large-scale plan of some area. When requested, certificates of commendation have been awarded indicating the ground covered by the student whilst studying at the Society.

The Society's part-time Instructor is Professor A. Stephenson, Reader in Surveying at the Imperial College of Science and Technology, who has a wide experience of exploration in the polar regions and Northern Canada. During the war Professor Stephenson was employed on air photographic interpretation in the Royal Air Force.

The last two years have seen a considerable revival in university exploration, and this summer the Society lent surveying instruments to seven expeditions as well as to seven individual travellers. The type of surveying carried out by these expeditions has been more confined and specialized than the exploratory surveys of the years before the war. The demand for instruments is steadily increasing, and the Society is considering replacing the equipment made available during the war to the War Office. The demands made this year have been some indication of the types of instruments that will be needed in the future, but it would be a very great help if heads of university departments and exploration clubs would suggest to the Society the kind of research work their future expeditions are likely to undertake and the type of instruments likely to be required over a long period.

Emphasis in the above is necessarily on university expeditions, of which there are now such a large number supported by the Society or the Geographical Magazine Trust. It has however been the traditional policy of the Society to assist the individual traveller or research worker to whom survey instruments are not available from any other source, and this the Society continues to regard as one of its main functions.

THE RECORD

RECENT FOREIGN AWARDS TO BRITISH GEOGRAPHERS AND SCIENTISTS

The commemorative medal of the world cruise of the Swedish research-ship *Albatross* which recently returned to Sweden with the expedition's leader, Professor Hans Pettersson, has been awarded by the Royal Society of Göteborg to Sir John Anderson; Rear-Admiral A. G. N. Wyatt, Hydrographer to the Navy; Sir John Edgell, Hydrographer to the Navy during the war; Commandant Jules Rouche, director of the Monaco Oceanographical Museum; and to Dr. J. N. Carruthers of the Admiralty Hydrographic Department.

Among recent awards in other fields, Professor L. R. Wager of Durham University received the Spendiarov Prize on September 1 at the International Geological Congress in London in recognition of his researches in Greenland and in the Himalaya. The Prize is awarded at every session of the Congress, and it was at the suggestion of the Russian delegation that the Prize for this session was given to a British geologist.

It was announced from Luxemburg on October 14 that the award of Commander of the Grand Ducal Order of the Crown of Oak had been conferred on Dr. K. C. Edwards of Nottingham University in recognition of his geographical researches in the Grand Duchy and for assistance given to the Luxemburg government during the war.

BRIGHTON MEETING OF THE BRITISH ASSOCIATION, 1948

Mr. J. N. L. Baker, Recorder of Section E of the British Association for the Advancement of Science, sends us the following note:

The meeting of the British Association at Brighton, September 8–15, suffered perhaps unfairly from the frequent comparisons made with that of the previous year. In Section E however there was no reason to complain either of lack of numbers or of narrowness of interest. The lecture hall was more than once filled with about two hundred persons, and the Presidential Address and the joint discussions were particularly well attended.

The meeting opened with three papers on the historical geography of Sussex. Dr. S. H. King showed how the threefold division of coast, downs and weald was reflected in the Domesday records; Miss G. J. Fuller traced the development of roads through the Weald in the eighteenth and nineteenth centuries and was able to correct some errors in accounts previously published; and Mr. W. H. Parker demonstrated how new settlements had grown up as the result of the coming of the railway, and how the motor-car had favoured the growth of "main road" villages. Mr. Parker then read a paper on the growth of Brighton written by Mr. E. W. Gilbert whose unfortunate absence deprived the Section of the leader of its excursion in the afternoon. Here again Mr. Parker deputized and, with the help of Dr. H. C. K. Henderson, showed members many of the features of Brighton referred to in the paper; the afternoon ended appropriately in the little-known lanes of the old town.

The President of the Section, Lord Rennell of Rodd, K.B.E., C.B., gave his presidential address on Friday morning with the title "Geography as a social science with special reference to Africa." Confining himself more particularly to "the social geography of present-day Man" he inquired what was the place of social geography in the field of thought and education. "If social geography is the science and study of man in his geographical environment, and if, as

seems to me inescapable, geographical conditions affect the spiritual as well as the material circumstances of the human race, then I suggest that geography, and especially social geography, is the natural bridge between the humanities and the natural sciences, and that without that bridge there can be no understanding, but only accumulation of facts." The President then turned to Africa and expressed the hope that by posing certain problems he would both stimulate research and demonstrate "outside our circle" the need and the value in the study of those problems of social geography. Africa could be divided into that northern part which had a history and that part beyond the deserts which had not. Why was there this difference? Why did Europe go to Africa and what have the various European countries concerned been trying to achieve there for the last fifty years? What has caused "the modern complication and mess which is Africa," with its ribbon development along the Guinea coast, its vast area of the Congo with "a miniscule door on the sea" and so on? Here in many spheres was work for the social geographer, who would "keep a broad outlook and seek to give broad answers," and "who would play his very large part in adopting our changing conceptions of African administration and in seeking to rationalize the mess which Western European nations, including ourselves, have made in the African continent." The address is published in *The Advancement of Science*, vol. 5, pp. 205–9.

A discussion on "Scientific aspects of colonial development" followed. Mr. R. W. Steel in dealing with the geographer's part in such development urged that a colonial atlas should be produced, a point elaborated by Dr. R. J. H. Church, who also pleaded for the establishment of a Colonial Research Institute and for better provision for the study of the geography of colonization. Mr. E. Paget gave instances from the West Indies of the materials available to the geographer. In the afternoon Dr. F. J. Fowler presented a very clear picture of the canal colonies of the Punjab, dealing first with the historical aspect and later with the colonization of this pioneer zone. Mr. A. McK. Frood discussed the post-war economic development of Egypt. He showed how the war had affected Egyptian agriculture, industry and trade, and considered the dual problem of restoring Egyptian economy to a peace-time basis and of supporting a rapidly rising population.

Under the expert guidance of Professor S. W. Wooldridge and Dr. H. C. K. Henderson, members of the section spent Saturday and Sunday in the Weald and greatly enjoyed the contrasts between the Central and the Western Weald as well as the many minor features which these excursions revealed.

The discussion on Monday morning on "Movements of population in the Commonwealth" suffered from its somewhat vague title. Professor Fawcett, who opened it, dealt with many general topics before considering the problem of present-day migration; Professor Brinley Thomas expounded the economics of migration, and Mr. R. R. Rawson dealt with white settlement in the tropics. The discussion wandered off into considerations of the relation of coloured and white people and ended inconclusively. In the afternoon the Section returned to papers. Mr. W. Smith made interesting and novel use of statistical material to arrange industries in rank according to their mobility with regard to materials. Dr. A. N. Harris discussed the geomorphology of north-east Wales and concluded that its pre-glacial relief resulted from the dissection of an extensive peneplain. Mr. J. M. Mogey presented the results of a survey, made in 1946, of Dungannon, Co. Tyrone, a town which combines within itself the two major functions of Ulster country towns, distribution trade and factory industry.

Tuesday morning was given to a joint discussion with Section C (Geology) on "The denudation of the Weald." Dr. A. E. Trueman, F.R.S., President of

Section C, presided, and the discussion was opened by Professor S. W. Wooldridge. Dr. A. J. Bull, Dr. J. F. Kirkaldy and Mr. B. W. Sparks followed with individual but related contributions. Professor D. L. Linton, Professor J. E. Williams and Professor A. A. Miller contributed to the discussion. It is impossible to do justice to this in a short note. By general consent it was the most successful discussion of the meeting and it is to be hoped that at least a full summary of it may be published.

The formal meetings ended on Tuesday afternoon with papers by Mr. F. W. Morgan and Professor E. Williams. The former, developing his earlier researches on German ports, dealt with the pre-war hinterlands of the German Baltic ports, while the latter, one of our two foreign guests, showed the importance of chemical weathering at low temperatures. Professor C. C. Cressy, also a foreign guest, was able to attend the earlier meetings only, but Professor Williams ably deputized for him at the Sectional Dinner which ended our meetings on Tuesday evening.

It remains to record the retirement from the office of Secretary of Professor H. C. Darby. The Sectional Committee suitably recorded in its minutes its appreciation of his services.

There were many items in the programmes of other Sections of interest to geographers, including the discussion in Section C on "Geology and air photography" to which Professor D. L. Linton contributed; the discussion in Section D on "Biological aspects of colonial development," and the papers in the same section on "British marine fisheries"; and papers by Professor J. H. Hutton, C.I.E., on "The Naga hills," and Dr. C. D. Darlington, F.R.S., on "Blood groups and language," both given to Section H. An evening discourse was given by Professor S. W. Wooldridge on "The Weald and the progress of the field sciences."

The next meeting of the Association will be held in Newcastle-upon-Tyne. Offers of papers should be sent as soon as possible to Mr. J. N. L. Baker, Jesus College, Oxford.

CARTOGRAPHIC DEVELOPMENTS IN SWEDEN

During a recent visit to the Kartografiska Institutet in Stockholm the writer of this note observed points of considerable interest to geographers. For the drawing of manuscript maps, a base is being printed in black on a stout transparent plastic sheet and, after the detail has been added in indian ink, the then irrelevant printed base information is wiped off. One advantage is that the base map information is easier to read in black than in the usual blue.

A most interesting series of maps being prepared for all Sweden, except Nordland, is the 1:10,000. This consists of a lightly printed, air photograph base, to which lithographic colour washes are applied; yellow for farmed land, dark green for water, green for woods (partly by symbols), while the black plate carries information about roads, railways, boundaries and names. Unfortunately the sale of these maps is limited and their export from Sweden prohibited on account of the air photograph base. Their preparation marks an advance in the cartographic information about the country and it is hoped that before long they may be freely circulated. A. C. O.

NATIONAL AND INTERNATIONAL RESEARCH IN NORTHERN CANADA

During the past twenty years the attack on Northern Canada (which is here taken as including Alaska, Newfoundland, Labrador and Greenland) has been gathering weight. Beginning as a series of individual efforts by traders, mining

geologists and research workers travelling by canoe or light aircraft, in the days when the radium deposits of Great Bear Lake were first discovered and opened up, it has gradually become a cooperative effort; this summer aircraft of all types from helicopters to four-engined North Stars, and U.S. and Canadian ships transported scientists and industrialists in large numbers almost to the extreme limits of the arctic islands. With the tremendous backing it received during the war years, the attack has become directed towards solving the many international problems associated with the area. It is gratifying to see government departments, the fighting services, scientific workers and business men all cooperating as they did in "Operation Cariberg," when thirty-two people covered 7300 statute miles in four days in a R.C.A.F. North Star, seeing for themselves a cross-section of the arctic and sub-arctic regions of Canada from Labrador to British Columbia and from the St. Lawrence to Coronation Gulf.

Readers of the *Polar Record* will have been kept informed of some of this activity. Now two Canadian publications are available which provide more detailed accounts of Canada's share in these activities. *Arctic* is the Journal of the Arctic Institute of North America and is to be published twice yearly; the first number appeared in the spring of 1948. In his introductory note the Chairman of the Board of Governors, Dr. J. Tuzo Wilson, describes the Arctic Institute as an international scientific society, and says that the Journal is a means of communicating information about the Arctic and the activities of the Institute to all its members. The scope of these activities is left in no doubt; after mentioning the international activity roused by the search for Franklin between 1848 and 1882, Dr. Wilson goes on to say: "To-day it is appropriate to look back a century and to realize that these same inhospitable regions are the scene of activity such as they have not known in the intervening years. Spurred by no tragedy, assisted by aids unknown even a generation ago, the exploration, mapping and scientific study of the North American Arctic is now being pursued on a scale never before possible. What a unique opportunity it is! The world revolves about the polar regions. The magnetic poles, the aurora, the effects of continuous summer sunlight, the winter's cold are strange physical attributes that make the background to this exploration of the world's last undiscovered frontiers as fascinating to-day as it has ever been."

A. L. Washburn, executive director of the Institute, stresses the opportunities for international cooperation in arctic research, and sums up the various interdependent fields of scientific work as "merely different phases of one international regional problem—the Arctic."

R. Glen Madill describes the search for the magnetic pole and the extension of the Dominion Observatory's network of magnetic stations in the Arctic, beginning with Ross's discovery of the magnetic pole area in 1831, and culminating in the tremendous activity of the last two summers. This has taken the form of occupying an ever contracting circle of stations round the present area of the magnetic pole. The maintenance of these circum-polar stations, involving journeys by canoe, snowmobile, R.C.A.F.'s Canso and the U.S.S. *Edisto*, makes a fascinating story. Eighteen stations were occupied in 1947, and the latitude and longitude of these stations, together with the observed values of declination, inclination, horizontal intensity and total intensity, are tabulated on page 17. Occupying them has not always been a straightforward task, and the R.C.A.F. crews are to be congratulated on their skill and courage in navigating and landing in the very bad visibility which they frequently encountered.

The centre of the new area of the magnetic pole is in northern Prince of Wales Island in approximately 73° N., 100° W., and it is here that more detailed surveys have been made this summer. It is a little surprising that the author of

this account makes no reference to the magnetic observations made on the flights of the R.A.F. *Aries*, nor to the subsequent U.S.A.A.F. flight in this area.

The several meteorological contributions emphasize the development necessitated by the ever expanding air activity, and the increase in upper air observations, chiefly by radiosonde methods. Indicative of this development are the comparative figures of the number of "first order" meteorological stations in Alaska—four in 1939, fifteen to-day. In Greenland there were four in 1873 and nineteen in 1947, whilst in Canada's Arctic and Sub-arctic there were forty-one weather reporting stations in January 1948. Some of the latter are occupied by United States personnel and some, like the most northerly at Eureka Sound in latitude 80°, are jointly operated by Canadian and U.S. observers.

Erling Porsild, in an article called "Greenland at the crossroads," makes very clear the beneficial effects of the decentralization of government during the Nazi occupation of Copenhagen, and the disappointment of the Greenlanders and Danes resident in Greenland on the publication of the report of the special parliamentary commission set up in 1946. This report dealt almost entirely in generalities and apparently avoided considering the demand for a shift of the executive offices of the administration from Copenhagen to Greenland.

True to its policy, the first number of *Arctic* has concentrated on the wider, international aspect of Canadian and near-Canadian arctic territory, and after reading it one is left in no doubt of the importance of the area and its tremendous possibilities. One is also reminded, incidentally, that in developing these possibilities some of nature's most formidable elements will have to be contended with.

The second publication relating to the Canadian Arctic and Sub-arctic, now available for reference in the Society's Library, is the *Arctic Circular*. It is published in duplicate form by the Arctic Circle, Ottawa, a club which has been formed to enable those interested in the Arctic to meet for informal discussions; and is edited by Mrs. Graham Rowley, a former Assistant Editor of the *Geographical Journal*. The *Circular* is more Canadian and less international in outlook than *Arctic*, and no activity is too small to be recorded providing it is of sufficient interest. Some idea of the variety and scope of articles appearing in the six issues that have been published to date can be obtained from the following selection: Biting insects of the Arctic—their effect on the development of industry; Indian and Eskimo health services; Reindeer and fishery statistics; Iron ore in Labrador and Quebec; Hydro station at Snare River for the Yellowknife development; Air-rescue operations in the far north; Progress in the building of the highway from Alberta to Great Slave Lake. The *Circular* also includes accounts of the university expeditions, many of which were supported by the Arctic Institute or by the Geographic Bureau.

A. STEPHENSON

THE CLIMATE OF PARIS

A useful compendium on the climate of the Paris region, 'Le climat parisien', by Charles Maurain, appeared in 1947 from the Presses Universitaires de France. It is of interest to geographers as well as to climatologists as having more than regional and local interest, as the author frequently discusses general principles. The first part dealing with the common climatological elements in the Paris region includes an account of radiation, whose importance, as its author rightly points out, is often neglected in textbooks. There follows in the second part a detailed discussion of the urban meteorology of the capital in comparison with conditions in the surrounding country. We get from this a

picture, only too familiar in our English cities, of the effect of smoke haze and fogs in diminishing winter sunlight. Soil conditions are dealt with in the third part, and human health and comfort in the fourth, which includes also a section on weather prediction.

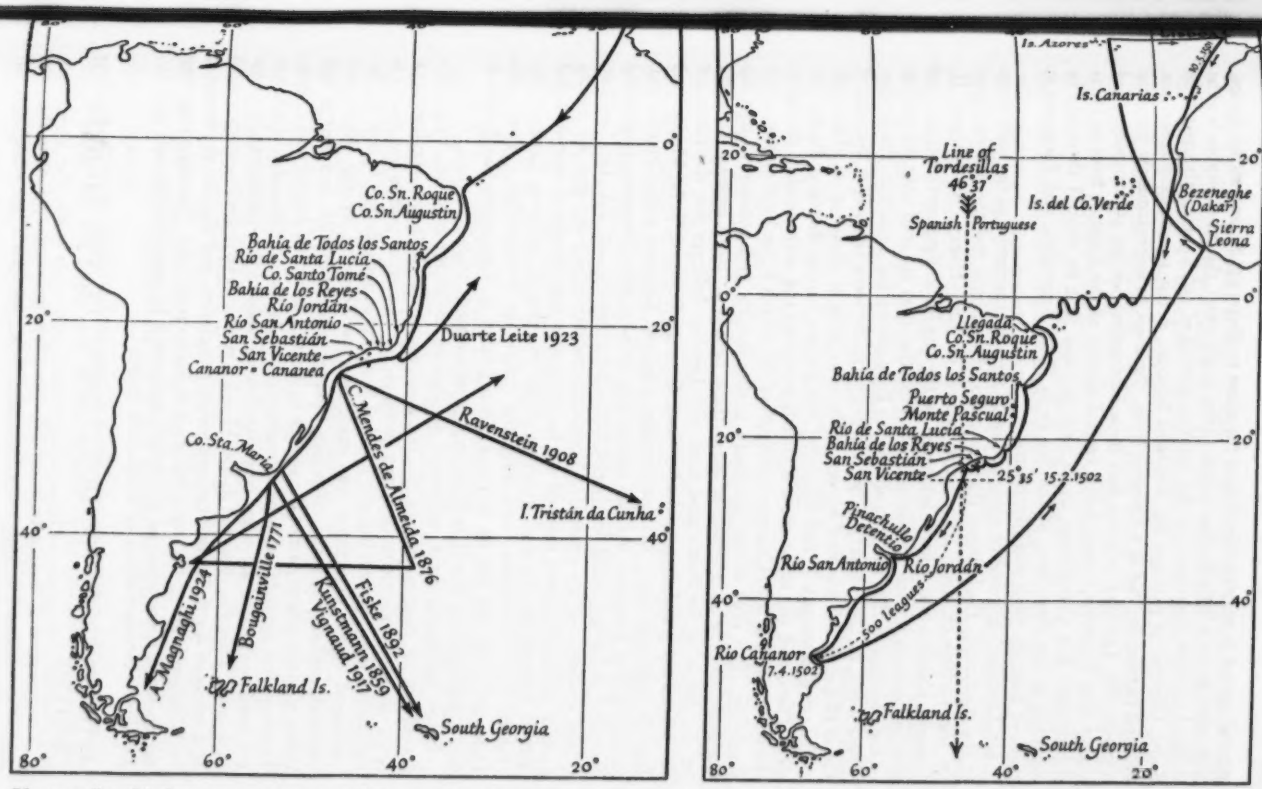
The Paris basin, which may roughly be identified with the Île de France, lies, like other parts of Northern France, in the belt with prevailing south-westerly winds, and is affected by the sequence of Atlantic depressions though to a markedly less extent, as the author notes, than the British Isles. The lowest descent of the barometer in a long record stops far short of the depths reached in stormy winter weather in the north of Scotland, though, so far as that goes, the highest level reached by the barometer in Paris does not quite rival that attained in the north of Scotland when an intense winter anticyclone reverses the normal pressure gradient in the Icelandic area. The situation of the Paris region on the other hand, in the transitional area between the maritime conditions of the Atlantic coast and the semi-continental climate of the upper basins of the Seine and Marne, leads to frequent changes of temperature which are often pronounced though rarely excessive. During seventy years of continuous observations between 1874 and 1942 at the Observatory of St. Maur, a few miles out of the city, the extreme maximum temperature (translating from Centigrade to Fahrenheit degrees) was 101 on 20 July 1900, and the extreme minimum minus 14 on 10 December 1879.

The author claims, no doubt justly, that Paris is blessed with an excellent climate, highly favourable to health and activity, and that the productivity of the neighbouring countryside is enhanced by a relief sufficiently accentuated to give great variety of slopes and of orientation of valleys. It may be noted that the mean annual temperature and rainfall and the frequency of rain and snow in Paris are much the same as in London though the number of thunderstorms is twice as large. A little colder in winter and warmer in summer, the greater continentality of the climate on the other side of the Channel is most noticeable during spells of extreme heat and cold, especially the latter. For instance, a month of such extreme rigour as the December of 1879, when the mean temperature in Paris was as much as 20 degrees below the normal of 38 degrees F., has never been matched in London where the coldest December, that of 1890, was only 10 degrees below the normal. In fact, "l'hiver terrible" of 1879–80, as Maurain calls it, seems to remain the standard of comparison for severe winters in France. L. C. W. B.

VESPUCCI'S THIRD VOYAGE: A NEW INTERPRETATION

In the autumn of 1947 Dr. Roberto Levillier of Buenos Aires gave a lecture under the auspices of the Hispanic Council in the Royal Geographical Society's Hall, "New light on Vespucci and the discovery of the River Plate." Dr. Levillier has devoted many years' study to the Vespucci problem, and has in preparation a detailed work on the subject. The true significance of Vespucci's voyages has aroused much controversy in the past, and it is not possible to examine here in detail Dr. Levillier's thesis, which was supported by numerous map facsimiles and sketch-maps. We hope to be able to give a critical appreciation of his book when it is published. In the meantime the following brief statement of his arguments, without comment, will be of interest to students of the history of exploration.

The principal authority for the course followed by Vespucci on his third voyage of 1501–2 off the eastern coast of South America is his 'Mundus novus.' Those who accept its veracity have interpreted the meagre details in various ways, but as will be seen from the accompanying sketch-map, they have in



Vespucci's third voyage, 1501–2: left, earlier interpretations of his route by various scholars; right, reconstruction of his route by Dr. Roberto Levillier from early maps

general agreed in making him follow the coast to about 25° S., and strike thence, or at some point a little farther south, to the south-east; the inhospitable land he claimed to have discovered in the neighbourhood of 50° S. being thought to be South Georgia or perhaps the Falkland Islands. A few critics have made him proceed parallel to, but at a distance from, the coast to approximately the same latitude. Dr. Levillier believes that these interpretations are all erroneous, and argues that Vespucci conducted a careful survey of the coast at least as far as the present Rio Camarones, in 44° 50′ S., and that he should therefore be accepted as the discoverer of the Rio de la Plata, Argentina, and Patagonia in place of Juan de Solis and Magellan.

Dr. Levillier's arguments are based upon a re-interpretation of the early maps of the continent. He believes that the gulfs, rivers, bays and the nomenclature on the earliest of these (the maps known as King-Hamy, Kunstmann II, Canerio, Cantino and others) are based on the results of Vespucci's voyage, and that earlier critics were mistaken in assuming that they covered only the portion of the coastline within the area allotted to Portugal by the Treaty of Tordesillas. These maps, on the contrary, show a large gulf in the same latitude as the Cape of Good Hope, which was well known at the time to be in about 35° S. This gulf, called on Kunstmann II and Canerio "Rio Jordán," must therefore be the Rio de la Plata, and the maps show a coastline continuing considerably farther to the south, with a "Rio Cananor" beyond 45° S., which is the limit of Vespucci's discovery. The crux of the argument is the identity and position of this Rio Cananor. On the next group of maps there figures a "Rio Cananea" in about 25° S., that is, in the Portuguese zone. Dr. Levillier believes that this name and the associated nomenclature derive from the expedition of Nuño Manuel and João de Lisboa in 1513–14. Later critics confused Cananor with Cananea and, assuming that Vespucci had not named any features after Cananea, interpreted Vespucci as having sailed south-east from that point (*i.e.* 25° S.). Dr. Levillier, on the evidence of the maps (for Vespucci's narrative does not give the names, simply claiming to have reached 50° S.) maintains that Vespucci examined and named features on the coast as far as 45–48° S., that is, as far as Cananor, the present Rio Camarones, including the Cerro de Montevideo ("Pinachullo Detentio") and the Rio de la Plata ("Rio Jordán"). The name Rio Jordán is first superseded by Rio de la Plata on Agnese's map of 1536.

Some historians have amended south-east to south-west in Vespucci's account of his course after 25° S., but even they make him pass the coast at a great distance without naming any features. Dr. Levillier points out that it is significant that on reaching the limit of Portuguese jurisdiction in 25° S., the command of the expedition was made over to Vespucci by the Portuguese captains, probably to avoid offending Spanish susceptibilities, and that he laid it down on the return part of the voyage to Sierra Leone, the Azores and Lisbon. Vespucci was probably seeking a passage to the Pacific on this coast, and it was not until he reached these low latitudes that he realized the continentality of the new land. This was reported in his 'Mundus novus' (1503) and 'Lettera' (1504) and accounts for their great contemporary popularity, and also for the bestowal by Waldseemuller of the name America on his map of 1507. The accompanying sketch-maps show some of the routes suggested by earlier historians and Dr. Levillier's reconstruction of Vespucci's course.

ASTRONOMICAL POSITION-FINDING IN THE EIGHTEENTH CENTURY

The question of the methods used by travellers in inland regions in the latter part of the eighteenth century to determine their positions is one which can only

be answered by reference to their books. There was not yet any standard procedure distinct from that in use at sea, or at fixed observatories on land. Possibly the earliest "hints to travellers" on the matter are contained in Maskelyne's first volume of the *Nautical Almanac* (1767). Latitudes were to be determined from the meridian heights of the sun or stars, measured either with Hadley's sextant, now coming into general use, or with an Astronomical Quadrant, equivalent to a quarter of the vertical circle of a theodolite but two or three feet in radius. A principal reason for issuing the almanac was to provide a means of determining longitude at sea *within one degree* from the Lunar Distances of stars; the predictions were based on Mayer's Lunar Tables which were considered to give the Moon's position correct to one minute of arc, hence the wide limit of accuracy in the resulting longitude. To determine longitude within a degree was a more useful faculty on a long ocean voyage than in fixing a position on land, and the *Almanac* included predictions of the eclipses of Jupiter's satellites as a more accurate method where the use of a fairly large telescope was possible; the method is discussed and travellers are urged to make full use of it. The occultations of stars and the later use of Lunar Distances on land require more accurate Lunar Tables than were then available.

James Bruce's 'Travels to discover the source of the Nile' (1768–73) and a report by Michael Topping in Dalrymple's 'Oriental repertory' (1786–87) illustrate the application of the methods. Bruce's equipment included "an excellent reflecting telescope of two feet focal length . . . also an achromatic telescope by Mr. Dolland nearly equal to a three foot reflector . . . a time-piece . . . a stop-watch . . . Hadley's quadrant . . . a large Astronomical Quadrant [which it took four men to carry]." On comparing his results for readily identifiable places in Egypt and on the Red Sea with the positions in a modern gazetteer, his errors in longitude are found to vary from ten minutes of arc up to half a degree. His latitudes are correct within a minute or so and a gazetteer does not admit of a closer comparison. At Perim, a difference of fifty seconds in the latitudes obtained from meridian altitudes with his two instruments is considered worthy of notice and he evidently preferred the "large Quadrant."

Topping's longitudes were more precise. He was employed by the East India Company as astronomer and surveyor and his journey from Madras to Calcutta was primarily for the purpose of making these observations. He says: "The latitudes were all taken with an excellent instrument on the Hadleyan principle . . . and an Artificial Horizon on the new Construction by Dolland, as were the altitudes for correction of the Chronometer [observations for Local Time]. . . . The Chronometer made use of was a small one by Arnold. . . . A Telescope of Mr. Dolland's, magnifying power about forty-seven diameters, was made use of for the Eclipses of Jupiter's Satellites." He adds that corrections for semi-diameter, refraction and so on were taken out to the nearest second of arc. He observed ten eclipses, so fixing the longitudes of four stations. Compared with the gazetteer the errors are remarkably small: $-07'$, $-13'$, $-02'$, $+03'$, $-03'$, $+01'$, $+02'$, $00'$, $+04'$, $+06'$. His latitudes do not differ from the gazetteer by more than a minute. He determined a number of other longitudes by the rate of his chronometer between the four eclipse stations.

Thus latitudes could be fixed within a mile and longitudes within perhaps a dozen miles, but the latter only at the expense of carrying unwieldy instruments and only when the eclipse observations could be made; it is unlikely that such observations were usual with the explorers of the period. The full title of John Barrow's map of South Africa is as follows: "General Chart of the Colony

of the Cape of Good Hope. Constructed from bearings, estimations of distances and frequent observations for latitude in travelling thro' the country in the years 1797 and 1798." Most travellers must have depended, for longitude at least, on "estimations of distances." F. G.

DR. DONALD THOMSON'S WORK IN ARNHEM LAND.

In 1937 Dr. Donald F. Thomson, of the University of Melbourne, was entrusted by the Commonwealth Government with a research mission among the little-known natives of Arnhem Land, in the Northern Territory. For two and a half years Dr. Thomson, winning the confidence of the natives and learning their languages, travelled extensively in the native fashion and collected much data on their anthropology and social structure. His geographical results included the discovery of the great Arafura swamp, many rivers, and portions of the coastline. Of special importance was his investigation of the cultural contacts between the natives and voyagers from Macassar. A preliminary account of this work, accompanied by a film portraying the life of the Djinba clan, who penetrate periodically into the Arafura swamp, living as tree dwellers, was given to the Society at an evening meeting in May 1939. In recognition of the great value of his geographical and anthropological discoveries, the Society awarded Dr. Thomson the Cuthbert Peek grant for 1948.

The outbreak of war and the strenuous duties upon which Dr. Thomson soon found himself engaged obliged him to postpone the preparation of his results for publication, and also the paper for the *Geographical Journal* to which we had been looking forward with great interest. In 1941 Dr. Thomson was sent to command the Northern Territory Coastal Patrol and Special Reconnaissance Unit in Arnhem Land, then threatened by the Japanese. In organizing the natives for guerilla warfare, he had many opportunities of extending his earlier work. Later, he led a patrol in New Guinea through the swamps between the Mappi and Obaa rivers, previously reported to be impassable. Despite continual rain, mosquitoes and leeches, and the necessity of living on what they could collect, the patrol got through, though Dr. Thomson was severely wounded. After a long spell in hospital, and much difficulty in gathering together his material (the whole of his film was destroyed by fire) he has now been able to resume work upon it, and we have received a long paper on Arnhem Land and its inhabitants, which we hope to begin publishing, with photographs and maps, in the next number of the *Geographical Journal*. In view of recent developments in Arnhem Land, we feel it is only fair to Dr. Thomson that the above facts should be set out.

LLOYD GEORGE MOUNTAINS: CORRECTION

We understand from the Surveyor General, British Columbia, that no recommendation has been officially made to reduce the altitudes established in the Lloyd George Mountains by the expedition led by Mr. F. S. Smythe, described in our last issue (*Geogr. J.* 111 (1948) 153–71). The altitudes given in the paper and on the accompanying map therefore stand, and the note at p. 170 should be ignored.

OBITUARY

MRS. MARGARET M. HASLUCK

Mrs. Margaret M. Hasluck, a Fellow of the Society since 1924 and widow of the late F. W. Hasluck, died on 18 October 1948 after a lingering illness. Mrs. Hasluck, a classical scholar of distinction, became a notable figure in Albanian affairs. She was the author of a bi-lingual Albanian–English grammar, and, during her residence at Elbasan, collected valuable notes on Albanian folk-lore. To the *Geographical Journal* she contributed three papers on the historical geography of Lake Ostrovo which appeared in 1936 and 1937. M.A

CORRESPONDENCE

THE RELATION OF GEOMORPHOLOGY TO GEOGRAPHY

May I be permitted to take the strongest exception to the conclusions offered by Colonel D. E. Sewell (*Geogr. J.* 111 (1948) 147) on the relations of geography and geomorphology? There is and has been a point at issue here for many years and I have dealt with it at length in an inaugural lecture delivered recently at King's College, London, to be published in due course. Here it must suffice to say that such a feature as the pre-Cambrian erosion surface mentioned is an element in an *existing* landscape—a surface on which mankind lives and moves. Its characteristics as part of human environment derive from the circumstances of its origin and subsequent exhumation, no matter what name we use for it. The North Downs are certainly a "cuesta" and under that simple word are subsumed a number of valid and valuable conceptions concerning form and structure, all of them relevant in studying the earth as "the home of man." I took occasion to answer Colonel Sewell's point concerning the Weald during the recent British Association meeting at Brighton. The transverse rivers of Sussex, part of "the present reality of the area as regards relief" and vital features in human geography throughout history, are in no wise to be explained as the simple drainage of the flanks of a dome. They would not flow as they do if the Middle and Later Tertiary history of the area had followed a different course.

Colonel Sewell seems to imply that all such genetic questions must be banned from the geographer's realm. Is this to apply also to the "human" features of the landscape of which the origin and evolution is "history"? I am loath to believe that any geographer would take up so narrow and obscurantist an attitude. It is widely agreed that the geographer is concerned with landscape in the widest sense of the term, with the physical landscape and the cultural landscape and the relation between the two. Both have evolved and are evolving and can in no wise be understood singly or in relationship, except from the genetic viewpoint, nor could vigorous and healthy minds consent to any "blinkered" partition of the field which sought to exclude this viewpoint.

The only one of Colonel Sewell's conclusions with which I agree is that "the traditional link between geography and geomorphology in this country dies

slowly if at all," and it is admittedly my earnest endeavour in association with a not inconsiderable group of friends and colleagues to see that it does not die. Had the disastrous and unphilosophic view which Colonel Sewell expresses found favour in the past, the *Journal* would have been deprived not only of Professor Strøm's work, but of classic pages from the pens of W. M. Davis, E. J. Garwood and a host of others. Let Davis's own words stand in refutation of the unseemly divorce proposed: "To look upon a landscape without any recognition of the labour expended upon producing it, or of the extraordinary adjustment of streams to structure and waste to weather is like visiting Rome in the ignorant belief that the Romans of to-day had no ancestors."

S. W. WOOLDRIDGE

2 *October* 1948

In a letter published in the *Journal*, 111 (1948) 147, Colonel Sewell has, on the plea of putting a stop to muddled thinking, raised a whirling cloud of confused issues. His opening assertion that Dr. Strøm's lecture on the geomorphology of Norway should have been read to some other Society is as graceless as it is unwarranted. The Royal Geographical Society has rightly, and for long, made a point of inviting contributions to its discussions and (as Colonel Sewell can read inside the cover of his *Journal*) to its publications from workers in cognate fields; and it is to be hoped that geomorphologists no less than meteorologists, botanists, oceanographers, archaeologists, anthropologists and ethnographers will continue to be welcome in the Society's House and the pages of its *Journal*.

But behind Colonel Sewell's exclusive attitude towards geomorphology and its practitioners is a fundamental misconception as to the nature of geography. By his remarks on the Weald he is in danger of being judged to share with Mr. Handyside, an earlier correspondent (*Geogr. J.* 109 (1947) 287–8), the view that "River action as such is not Geography; it becomes so when it is studied in its relation to man." Yet the fallacy of this view is patent. The study of river action in relation to man may be hydraulic engineering, riparian law or much else, but it will not be geography. Geography is not concerned with the study of phenomena in relation to man, and still less, as it is frequently stated in this country to be, with the study of man in relation to his environment. The latter is the proper field of human ecology. Geography, as conceived and taught by such acknowledged masters as Vidal de la Blache or Hettner, is concerned with the study of areas of the earth's surface; with the recognition in any area of the elements—whether of terrestrial, cosmic or social origin—which have conspired to give it its unique character; with the analysis of the inter-relations of these elements; and with the verbal or cartographic presentaton of such an areal complex as a whole. Or, as Henri Baulig has phrased it, "la géographie aboutit à la description raisonée, explicative, des paysages." Clearly in all this, systematic geomorphology—the study and classification of landforms *per se*—has no part. Equally clearly there can be no reasoned, explanatory description of areas that does not draw heavily upon geomorphology for basic facts. Nor can the regional geographer reject half the facts his morphological colleague provides. The mid-Tertiary planation of the Weald is a fact of the present landscape and a factor to be reckoned with in any serious attempt to write the geography of the area. Colonel Sewell's rhetorical question on this point was in fact answered in detail by Professor Wooldridge in an article contributed to the *Scottish Geographical Magazine* (48 (1932) 30–6) sixteen years ago, of which I venture to remind him.

When Colonel Sewell complains that "Geographers in this country are using geomorphological terms as geographical ones" it is doubtful if the word "geo-

graphical" in this context has any meaning whatever. "It is noteworthy," says Baulig, "that unlike the systematic geographies, regional geography has no technical vocabulary." How else, then, can it describe landforms save in morphological terms?

Regional description is the geographer's central task, just as the elucidation of earth history (stratigraphy) is that of the geologist. But geologists pursue also such systematic studies as mineralogy and palaeontology, necessary to their calling, without having to apologize for it or exciting the wrath of chemists or biologists. In Germany, as in this country, geomorphology (in spite of what Colonel Sewell appears to imply) has been, and is, chiefly pursued by geographers. The writing of the later chapters of the geological history of Europe may have been retarded thereby, but geography has gained much by the association. And if Colonel Sewell is tired of being foster parent he should perhaps be warned of the resistance that may be aroused by attempts to restore unwanted children to their supposedly most intimate relations.

DAVID L. LINTON

14 *October* 1948

THE RAW MATERIALS OF COTTON

After the removal by ginning of the seed from 25 tons of seed-cotton there will remain 8 tons of raw cotton. On page 241 of the *Journal* (vol. 109, 1947) your reviewer W. G. E. refers to unginned cotton as raw cotton. He is wrong. The cotton obtained by the removal of the seed is the raw material of the spinner and is known as raw cotton.

AUSTIN EASTWOOD

Baghdad, 19 *July* 1948

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The following have been elected Fellows and Associate Members of the Society:

On 5 July 1948

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On 25 August 1948

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